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COMPUTERWORLD

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Compaq expected to beat IBM's PS/2 Model 80 to market with a 20-MHz 80386-based personal computer. Page 6.

Independent tests of IBM 9370s indicate the machines boast power to spare and are easy to use. Page 4.

Britton Lee powers data base machine line up to 10 MIPS with 32-bit version. Page 8.

CMI's bid to remain independent is blocked by court ruling approving acquisition by new leasing giant Continental Information Systems. Page 94.

Is DEC's success going to its head? Some observers say IBM is now the easiest to deal with. Page 43.

While DG whimpers, Microsoft, Amdahl and even Wang ride a profit boom. Pages 67 and 93.

Business users issue demands for phone system Open Network Architecture. Page 37.

In yet another attempt to grow through merger, 3Com last week agreed to link up as the majority partner in a pooling of interests with Bridge Communications. Page 93.

Key OS/2 veil lifted

Presentation Manager to ship in first half of '88

BY ED SCANNELL
CW STAFF

A Microsoft Corp. official last week said the Presentation Manager, the graphics interface for the firm's MS OS/2 operating system, will be available by the end of next year's second quarter. The statement marks Microsoft's first public indication of an availability date for the key operating system component.

A source close to IBM last week confirmed that IBM also plans to ship its own version of the Presentation Manager during the first half of 1988.

The disclosures are expected to help users and software developers better formulate their plans for using OS/2, which is scheduled to ship in the first quarter of next year. There has been some confusion in both camps about when the Presentation Manager will ship. Moreover, some developers last week said they are skeptical over whether Microsoft can meet its shipment dates, and users said deliveries are too far off to have much impact on their current purchasing plans.

In an interview with *Computerworld*, Paul Sribhibhadh, marketing manager of Microsoft's Xenix group, said, "A delay in the availability of the Presentation Manager would stretch out development under OS/2. It would be to our disadvantage not to deliver by the end of the second quarter, because it opens the door for some other product to step in and fill the void."

The source close to IBM said Sribhibhadh's remarks "are on target with IBM's internal scheduling."

Interface date shrouded

Sribhibhadh also said Microsoft will develop a Presentation Manager-style interface for its version of Unix, being jointly developed with AT&T. While Sribhibhadh said the Microsoft-AT&T product would be available in the middle of 1988, he declined to say when the graphics interface for the program will be

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Users: DB2 chokes on volume test

BY CHARLES BABCOCK
CW STAFF

SAN FRANCISCO — Results from a recent benchmark by Charles Schwab & Co. indicate that the IBM DB2's performance as a transaction processor is highly application-dependent and that in most cases, DB2 cannot deliver the 62 transaction/sec. measured at a Danish bank and often cited by IBM.

In addition, the Schwab benchmark raises the question of how much IBM will be able to improve the performance of DB2 without changing the system's approach to record locking. Schwab MIS officials not only found DB2 limited to 18 transaction/sec. for their complicated discount stock brokerage trans-

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IBM musters forces on application front

BY ROSEMARY HAMILTON
CW STAFF

RYE BROOK, N.Y. — IBM last week reorganized its application software resources in a move observers called a stepped-up effort to keep major software vendors in the IBM fold and to ward off encroachment by Digital Equipment Corp.

The new organization, called the Application Systems Division, is IBM's first serious step in a long-range plan to become a major provider of applications software, an area in which it has done poorly in the past, observers and third-party vendors said.

The move was also seen as a peace offering to third-party developers, who have been lured into the DEC camp by weakness in the mainframe market and by fears of IBM competition. IBM officials took pains last week to point out that the new division would not compete with major third-party developers in cross-industry markets.

"One of the fears of indepen-

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Attractive solutions

Projected worldwide growth for applications software is the focus of IBM's new software division

INFORMATION PROVIDED BY INTERNATIONAL DATA CORP
CW CHART: MITCHELL J. HAYES

DG in tailspin; sales dip, losses threaten recovery

Mini maker lays off 950 as competitors soar

BY CLINTON WILDER
CW STAFF

WESTBORO, Mass. — Data General Corp. last week announced its fourth loss in the past nine quarters and its third massive corporate layoff in three years, prompting several analysts to express concern about the company's long-term hances for recovery.

DG reported a loss of $65.1 million, or $2.40 per share, with most of the loss resulting from harges related to an announced layoff of 950 people, or 5.8% of its worldwide work force. Revenue declined 3.6% to $313.6 million. The company indicated it will downgrade efforts to sell into large corporate accounts.

Since reaching a peak of 17,970 employees in early 1985, DG's work force has now seen three major reductions that have lowered it by a total of 15%. DG laid off 1,400 employees in 1985 then cut 900 more positions and closed two manufacturing plants last year.

Particularly troublesome to corporate observers is the way DG's continued financial ills stand in stark contrast to the recently ended quarters of its competitors in the minicomputer industry — Prime Computer, Inc., Wang Laboratories, Inc. and, in particular, Digital Equipment Corp., its traditional rival.

DEC reported another record-shattering quarter last week, ending a fiscal year in which profits soared 84%.

Vicious downward spiral

To many industry analysts, DG is caught in a vicious downward spiral that threatens its long-term visbility as a full-service minicomputer and office automation provider.

Although some analysts have expressed confidence that DG can climb out of its hole with continued cost controls, others see a serious warning in the current rising industry tide that is leaving DG behind.

"Their repeated attempts to cut back and restructure raises

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NEWSPAPER

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Three from Britton Lee. Britton Lee showcases three configurations of 32-bit relational data base machines, repackaged versions of its mid-range systems and a series of low-end processors. Page 8.

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"I think it's anti-DEC, it's not antisoftware."

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MSA CHAIRMAN

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NEWS

Bill to loosen controls on low-level exports

BY MITCH BETTS
CW STAFF

WASHINGTON, D.C. — The massive trade bill passed by the Senate last week contains an industry-backed section that would relax U.S. export controls on low-level computer equipment.

The export controls section in that bill and a House version would eliminate the current requirement to obtain export licenses for 16- and 32-bit computers with less than 8M bytes of random-access memory that are sent to any of 15 noncommunist countries.

This action would allow systems based on Intel Corp.'s 80286 and 80386 chips and Motorola, Inc.'a 68020 chip to be exported with a minimum of red tape, according to William Chastka, vice-president of Washington Resources International, a computer export consulting firm in Washington, D.C.

Cocom members safe

As a practical matter, the bills allow firms to export any product that they now can send to the People'a Republic of China — such as the IBM Personal Computer AT and the Digital Equipment Corp. Microvax II — to countries that are members of the Coordinating Committee on Multilateral Export Controls (Cocom) without prior U.S. government approval, Chastka said.

The House and Senate bills also contain a variety of other provisions aimed at loosening controls on exports and re-exports of high-technology goods to foreign countries.

"Members of the computer industry should recognize the importance of getting involved and expressing support for these provisions, because they could be traded away or watered down in conference," Chastka said, referring to the forthcoming joint House and Senate conference that will resolve differences in the trade bills passed by each chamber.

Export controls are intended to prevent the diversion of high-technology products to Soviet-bloc countries for military use. In the past, the U.S. export controls program was dominated by the Department of Defense, but this year, the Reagan administration and Congress decided to side with business interests in light of the U.S. trade deficit [CW, Feb. 2].

The computer industry has long argued that overly stringent export controls on low-level products hurt the competitiveness of U.S. firms and do little to help national security because the low-level products can be obtained from other sources, such as countries in the Pacific Rim.

"We should focus our limited resources on controlling those items that really make a difference [in national security] and aren't available around the world . . . in other words, build a higher fence around fewer items," said Jim LeMunyon, senior manager of governmental affairs for the American Electronics Association.

'Soviet Technology Relief'

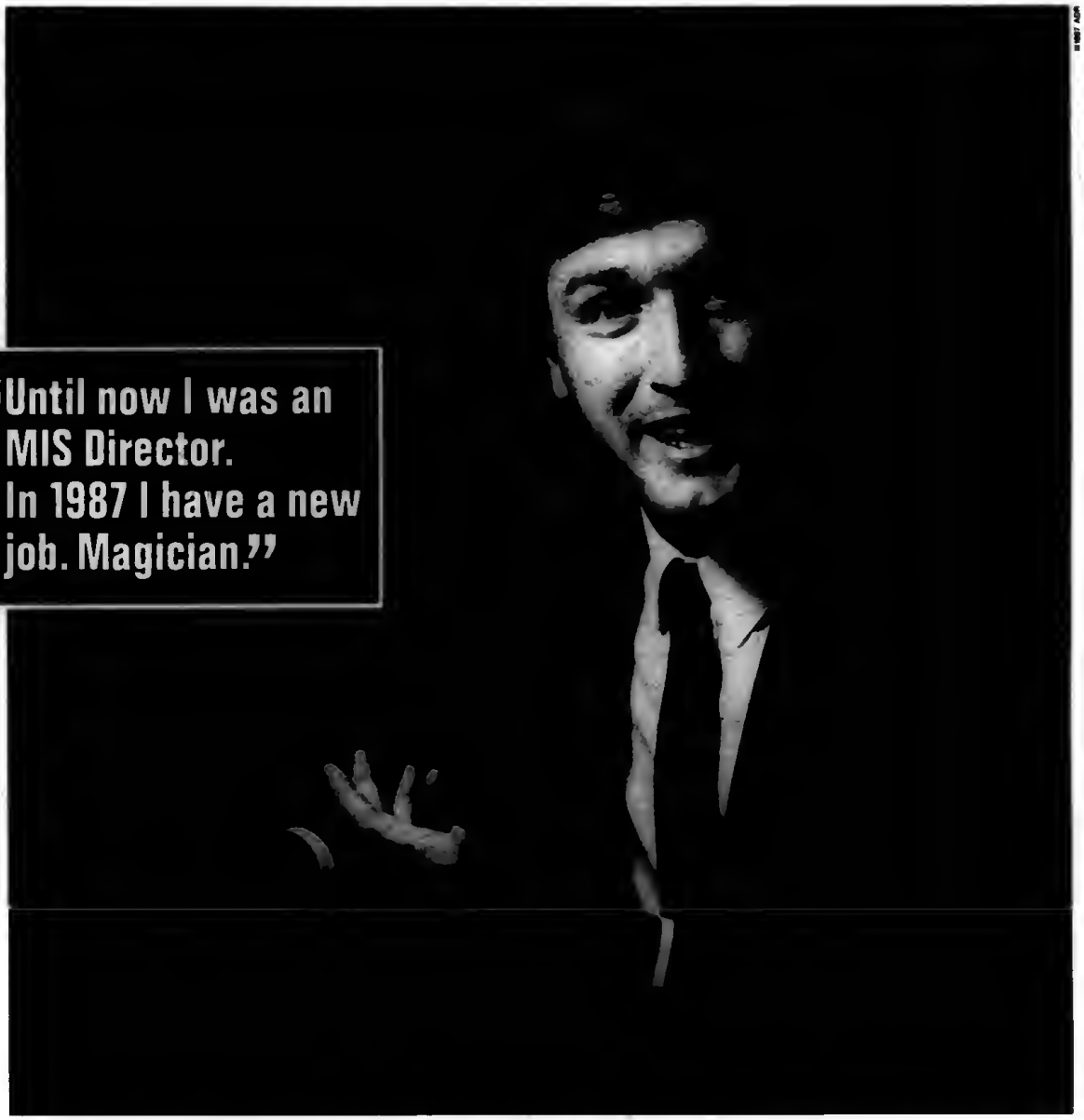
However, legislation aimed at relaxing export controls is fiercely opposed by conservatives, who have dubbed it "The Soviet Technology Relief Act of 1987." Rep. Duncan Hunter (R-Calif.) and Richard N. Perle, a former Pentagon official, warned that the decontrol measures will send U.S. allies the wrong message at a time when the U.S. is urging them to strengthen export controls in response to the sale of submarine technology to the Soviet Union by Japan's Toshiba Machine Co. and Norway's Kongsberg Vapenfabrik [CW, June 29].

"Ship American technology with reckless abandon to any Cocom country — as the House bill would authorize — and there will be countless cases like Kongsberg-Toshiba," Perle said at a recent congressional hearing. He said it is hypocritical for Congress to impose sanctions on Toshiba and Kongsberg in one part of the trade bill and to weaken U.S. export controls in another. The Senate bill contains a two- to five-year import ban on Toshiba and Kongsberg products [CW, July 6].

Although the computer industry supports the export control reforms and several other provisions in the Senate trade bill, the Computer and Business Equipment Manufacturers Association (CBEMA) said it is "deeply unhappy" with major parts of the omnibus trade bill and may support a presidential veto.

CBEMA spokeswoman Charlotte LeGates cited several objectionable sections in the bill, including one that calls for mandatory retaliation against foreign unfair trading practices and another that requires manufacturers to give workers advance notice of plant closings and layoffs.

LeGates said CBEMA favors the bill'a provisions intended to open foreign markets to U.S. telecommunications equipment and services, strengthen international intellectual property rights and institute a standard coding system for products shipped in world trade.



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Users give thumbs-up to 9370

Throughput, simplicity impress early customers of mid-range unit

BY STANLEY GIBSON
CW STAFF

Several users who recently tested IBM's 9370 models gave the much-awaited mid-range processor generally high marks, noting that the high-end Model 90 in particular runs with power to spare.

A Midwestern retail chain, looking closely at leasing 9370 processors, recently tested its programs on two 9370 models at IBM's Dallas data center, where the vendor has been inviting a number of users and developers to test applications.

"The 9370 has a lot of horsepower. We are impressed with the box," the user said. His programs were designed to run on IBM 4361 Model Group 5 machines. In Dallas, the user tested two programs on 9370 Models 60 and 90.

Models 20 and 60 of the 9370 began general-availability shipments last week. Models 40 and 90 will be shipped on the same basis in late October, IBM said.

'Blew our mind'

The CPU time "blew our mind," the user said, adding that the low CPU utilization on the Model 90 gave him added reason to seriously consider moving to the machine. He said he may want to use 9370s at different store locations to keep track of inventory and billing.

The user had been concerned that he might be forced to move to a considerably larger and more expensive IBM 4381 system, which would require a communications controller and other specialized equipment.

In the user's tests, CPU utilization on the 4361 was as high as 32% for one application and 20% for another. The 9370 tests showed CPU use of only 22% and 12%, respectively, for the same applications (see chart).

Bench pies

Benchmark tests performed for a retail chain at IBM's Dallas data center indicate less CPU utilization by 9370 Model 90 than the 4361

Processor	Number of DASD adapters	VSAMtune used	CPU utilization	
			Job 1*	Job 2**
4361	1	No	32%	20%
4361	2	Yes	28%	20%
9370 Model 90	2	No	22%	15%
9370 Model 90	2	Yes	23%	12%
9370 Model 90	4	Yes	22%	12%
9370 Model 60	4	Yes	55%	28%

* Billing
** Daily item update

CW CHART

The user found that a software product called VSAMtune, made by Macro 4, Inc. in Mount Freedom, N.J., considerably increased performance, particularly in direct-access storage device efficiency.

VSAMtune can assist a user in setting up buffers and files of appropriate sizes, according to Geoff Parnell, director of marketing for Macro 4. Changing buffer sizes can be particularly helpful on batch jobs, according to Parnell.

The user found that IBM's older 3370 disk drives ran faster than its newer 9335 drives. But VSAMtune speeded up the 9335s considerably, the user found. IBM has made no claims that the 9335 runs faster than the 3370 and has said that in some instances, it may run slower. IBM has also said 9335 performance may be boosted by "system tuning."

The user said he had no problem porting his software applications over to the 9370s be tested. Other users have also reported little difficulty in getting 9370 operating systems up and porting applications.

"As far as ease of use is concerned, IBM is telling the truth," said software developer Kevin Gould, 9370 performance manager at Computer Corporation of America in Cambridge, Mass. He said the VM/IS operating system that is sold with the 9370 is packaged so that a nonsystems person can use it.

"We are very surprised at the overall performance," said Gould, who was in Dallas recently to test his firm's Model 204 data base management system on the 9370. He said he also found CPU utilization lower than expected.

Remote diagnostic feature

Gould also praised a remote diagnostic feature available on the 9370. Using an IBM Personal Computer AT or Personal System/2 as a terminal, IBM service headquarters in Endicott, N.Y., can remotely diagnose the system, he said.

"The 90 is incredibly powerful, but I'm a little hesitant about the 60. It's not that good for high volumes," said a representative of another software development company who recently performed tests in Dallas.

He said statistics showed that the Model 60 used more than twice as much of its CPU power and had double the response times of a Model 90 when both machines ran the same general ledger program.

However, he said he was able to tune the Model 60 system to get better performance by increasing buffers and using VSAM Shared Resources.

I/O bottlenecks

I/O bottlenecks also became apparent on high-volume programs while running the Model 60.

"On the 90, if you have I/O bottlenecks, it will chug along, but on the 60, you'll have some trouble, unless you know how to tune it. You need someone with technical expertise," the software firm representative said, indicating that the system cannot be run effectively in all applications by a nontechnical person.

The developer said he looks forward to additional high-end 9370 models, which IBM has indicated will be offered in the future.

However, he expressed some doubt about the future of the Model 40, reporting that few users are interested in testing the machine at the Dallas center.

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Lotus buys Datext, aims move at CD-ROM market

BY CLINTON WILDER
CW STAFF

CAMBRIDGE, Mass. — Signaling that it considers compact disk/read-only memory (CD-ROM) products to be a strategic market, Lotus Development Corp. last week announced the acquisition of Datext, Inc., a supplier of CD-ROM corporate and business data bases. Terms were not disclosed.

Lotus said it will integrate the Datext products with its current CD-ROM product line, One Source, a series of data bases for investment analysis.

Lotus acquired those data bases when it purchased Isys Corp. in 1986 and has since transferred them from floppy disk and Bernoulli storage media to CD-ROM technology.

Woburn, Mass.-based Datext was founded three years ago as a unit of Atlanta-based Cox Enterprises, Inc., a large print and electronic media holding company. Datext had been owned partly by Cox and partly by its 65 employees.

'Determined to be leader'

"With this acquisition and future moves that you'll see us make, we are determined to be a leader in the CD-ROM market," said Don McLagan, vice-president and general manager of Lotus's Information Services Group.

"We have combined the two market leaders in really delivering products — as opposed to others, who have written books and held conferences," McLagan added.

Lotus archrival Microsoft Corp. has sponsored two annual conferences centering on CD-ROM technology.

There appears to be little overlap between the Datext and One Source products, said Steve Sieck, vice-president of electronic services at New York research firm Link Resources Corp.

Aimed at general users

Lotus's One Source is used primarily by professional investment analysts, while Datext's corporate and industry data bases and article abstracts are targeted at the general business user.

Lotus's 1-2-3 is the key to the company's CD-ROM strategy, Sieck noted.

"Lotus is the right company to be capitalizing on the potential of CD-ROM," he said. "They have the standard application for numeric business information, and CD-ROM is the fastest way to get information into that spreadsheet. Datext was worth more to them than to other companies."

Sieck estimated Datext's annual revenue at $8 million to $10 million.

Growing CD-ROM market

The CD-ROM market will grow to $1.5 billion annually by 1990, according to Link Resources.

Datext Chairman David Roux, who will manage both the One Source and Datext product lines and will report to McLagan, predicted that demand will increase dramatically as the price of CD-ROM technology comes down.

"The delivery piece itself will become a standard," Roux said. "All the value added is in the repackaging of the data."

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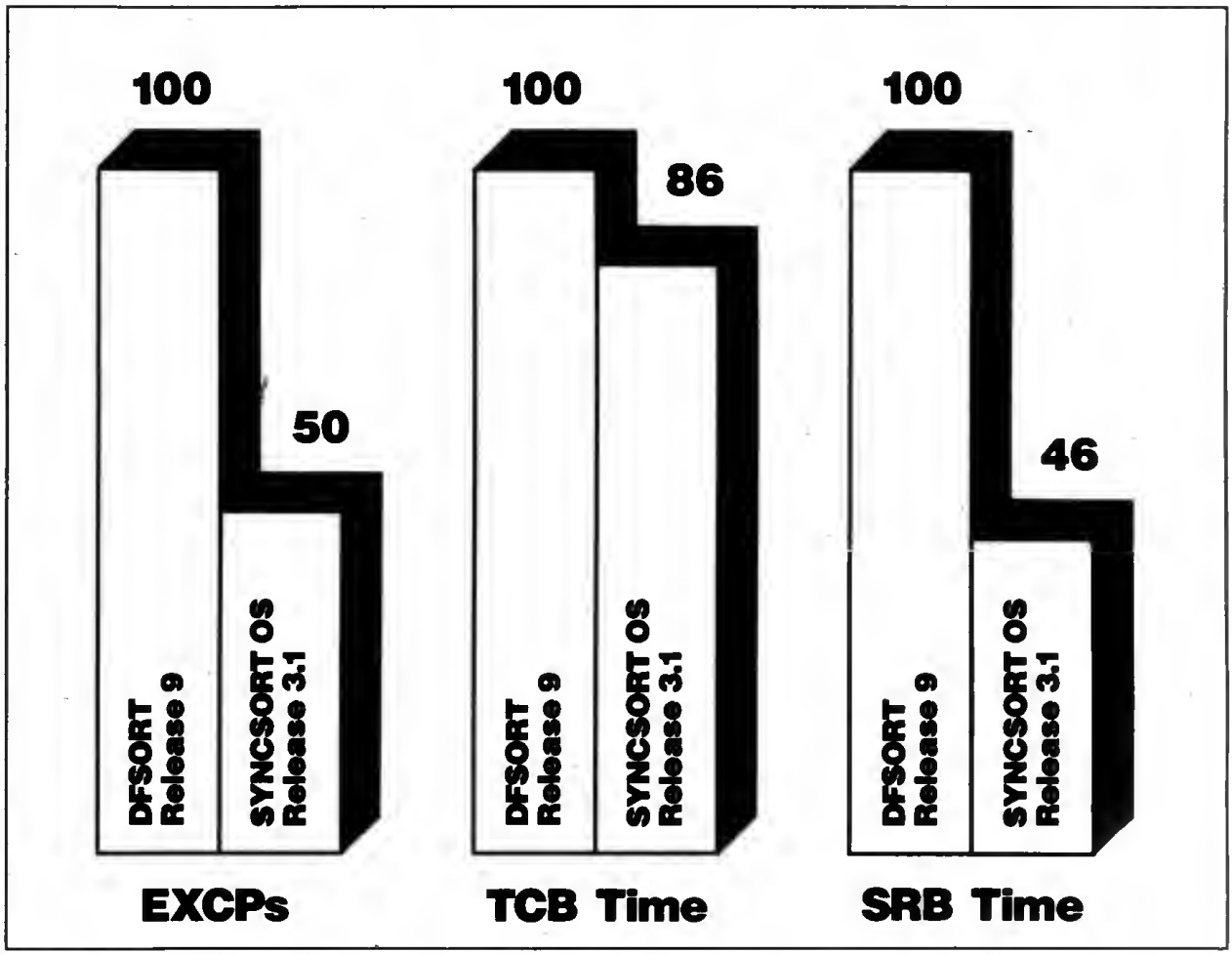

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IBM musters

FROM PAGE 1

dents has been that IBM will make an offering that competes with [the independents'], so they've been going to other vendors," said John Imlay, chairman of Management Science America, Inc. (MSA). Last week's announcement, he said, is "a peace offering from IBM to say, 'We're friends, and we want you.' "

Uphill climb

However, IBM must overcome much skepticism to establish itself in the applications industry. "I have never looked at [IBM] as being in the end-user market," said Terence Connor, information systems manager at the Animal Health Products division of Smithkline Beckman Corp. in Philadelphia. "I think they'll have an uphill climb in convincing us that what they have is just as good as third-party offerings."

The Application Systems Division will serve two functions, said Joseph Guglielmi, an IBM vice-president who was named president of the new division.

First, it will coordinate all future software development, including work on existing application offerings, at 11 software development facilities worldwide. This will bring together 6,000 development and development support staff members, the majority of whom previously worked for IBM's Information Services. That group has been responsible for development of such applications as Displaywrite for the IBM Personal Computer and the Manufacturing, Accounting and Production Information Control System.

Second, the Application Systems Division will be responsible for acquiring application software products in key market segments, including office systems, computer-integrated manufacturing (CIM) and financial systems. IBM will maintain its current software marketing structure, which encompasses the North Central Marketing Division, the Southwest Marketing Division and the National Distribution Division.

In addition to its focus on office, CIM and financial systems, the new division includes two software subdivisions.

One is categorized as integrated and enabling software and will cover application development tools. Current products in this area include IBM's Cross System Product, VS Cobol II, Query Management Facility and Screen Definition Facility.

The other subdivision has been dubbed a general systems group, which Guglielmi said is "our terminology for all other vertical markets." This group will develop systems for vertical markets such as hospitals, distributors and construction companies, he said.

Guglielmi said IBM will continue to select key market segments and does not intend to provide cross-industry applications. Frank Dodge, president of McCormack & Dodge Corp., said he received a telephone call from IBM following its announcement in which representatives "took great pains to tell me that in my area, they would be absolutely no competitive threat."

A vendor relations unit of the Application Systems Division is responsible for increasing IBM's alliances with software vendors and for encouraging these developers to write applications for IBM's Systems Application Architecture. IBM would not comment on what new products will emerge from the division. For now, the new division is intended to guide software industry efforts in the IBM direction, particularly for the mid-range market, analysts said.

Major battleground

The mid-range market has become the primary battleground between IBM and DEC, with IBM pitting the 9370 against DEC's VAX offerings. In the past few years, a number of major software vendors, including MSA, M&D and Cullinet Software, Inc., have moved into the VAX market, helping to position DEC hardware as a viable option for departmental and host systems in business.

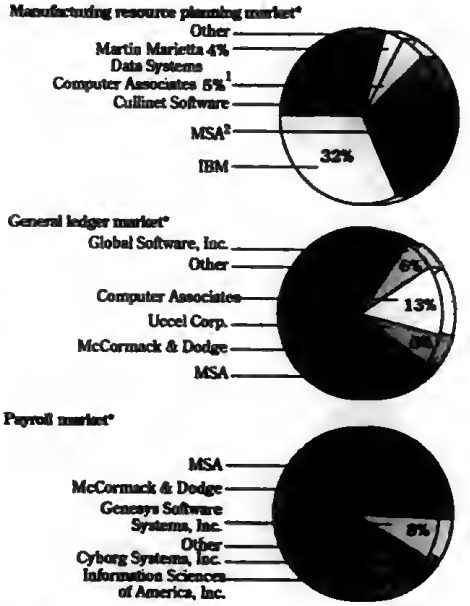
"We're not seriously considering DEC right now, but we're keeping our eye on them," said Paul Fusco, director of MIS at General Cinema Corp. in Chestnut Hill, Mass. "I've never looked at IBM as a strong application software supplier. It seems they've been forced to do this, and we'll benefit from it."

While Guglielmi would not comment specifically on DEC, he said a primary purpose for the Application Systems Divisioo is the "continuation of our focus on mid-range opportunities."

Such efforts will be a direct shot at DEC, said Charlotte Walker, a senior vice-president at L. F. Rothschild, Unterberg Towbin in New York. IBM's announcement, she said, "is much less of a threat to the software companies than it is to DEC. Whoever has the most quality applications wins. They'll try to do it by forming strategic alliances."

Applied marketing

IBM is a leader in the manufacturing applications market, but its new division is likely to seek a presence in other areas dominated by independent vendors



* For IBM and plug-compatible mainframes
[1] Based on Software International Corp. acquisition last year
[2] Includes market share of Connerv Corp., which was acquired by MSA last year

INFORMATION PROVIDED BY FOCUS RESEARCH SYSTEMS, INC.
CW CHART

Compaq will offer 20-MHz Deskpro 386

BY ED SCANNELL
CW STAFF

In an effort to stay one step ahead of IBM in the Intel Corp. 80386-based microcomputer market, Compaq Computer Corp. is expected in early September to introduce a 20-MHz version of its Deskpro 386 that will be equipped with 170M-byte disk drives.

The system will compete directly against the 20-MHz version of the Personal System/2 Model 80 that IBM has promised to deliver in the fourth quarter. Compaq has scheduled a meeting for analysts in New York this week, at which some speculated the company will demonstrate and explain the market positioning of the system.

"They have said all along that they wish to accelerate the performance threshold in relationship to IBM. They want to keep that 'hot-box' leadership," said Michael Geran, an analyst with E. F. Hutton & Co.

'Beat IBM to punch'

"The timing is ripe for this. They are, unquestionably, going to beat IBM to the punch," said Paul Evans, an industry analyst with S. G. Warburg & Co. "I'm rather surprised they have waited this long. The only explanation is that demand for the existing product is so strong." Compaq sold more than 50,000 Deskpro 386s by the end of the second quarter, several analysts said. They said they expect demand for the system to remain strong for the rest of the year, which will exert pressure on IBM's offerings in the 80386 market. IBM shipped its 16-MHz 80386-based Model 80 late last month. Compaq delivered its 16-MHz system last fall. IBM's 20-MHz system will have a 115M-byte drive and can accept another 115M-byte drive.

Asked to comment on the enhanced system's introduction, Compaq officials said company policy prohibits them from commenting on such reports.

The 20-MHz system is expected to be offered in several configurations, each with different memory capacities, according to one analyst. He said be also expects Compaq to lower the price on the Deskpro 386.

Sources also said last week that the company will deliver an 80386-based version of its portable and an 80386-based graphics workstation this fall.

West Coast senior correspondent Julie Pitta and staff writer Alan Ryan contributed to this report.

IBM unit zeros in on mid-range support

Shaking up its marketing strategy, IBM last week announced the creation of a mid-range support organization.

IBM Vice-President Larry Ford was named to the new position of assistant group executive, mid-range systems, Information Systems Group, where he will report to Edward Lucente, IBM vice-president and Information Systems Group executive. Previously, Ford was assistant group executive for marketing and support for all systems at the Information Systems Group.

Lee Dayton will succeed Ford, IBM said. Dayton will be responsible for large systems, workstations and several other marketing areas. A part of the strategy is to bring users of Digital Equipment Corp. and other vendors' equipment to IBM's mid-range products. "We want to have conversion and coexistence with all participants," Ford said. "We want all vendors to participate in Systems Application Architecture."

"They have set Ford up to go head-on with DEC," commented an MIS executive for a Midwestern machinery firm.

Ford said the creation of his organization is part of a pattern of IBM's targeting the mid-range more closely. He pointed out that since early this year, IBM's approximately 100 Customer Solution Centers around the country have been dedicated solely to the mid-range. In existence for a number of years, the centers had previously served all kinds of systems, Ford said.

"Giving an executive responsibility only for mid-range systems will allow us to increase our attention and resources on this very important part of our business," Lucente said in a prepared statement.

"We saw the principal issue in the mid-range as an application solution and support structure that can be flexible and tailored to users' particular requirements," Ford said. The restructuring will mean customers should be able to get quicker answers to their questions than before, he added.

STANLEY GIBSON

Unisys revamps workstation operating system

BY JEFFRY BEELER
CW STAFF

SARATOGA, Calif. — Unisys Corp. last week enhanced its Intel Corp. 80286- and 80386-based workstation family with a revised operating system that reportedly allows the machines to run in protected mode and address 4M bytes of random-access memory.

A press conference here marked the introduction not only of Unisys's multiuser, multitasking BTOS II operating system but also of a cluster controller that links the vendor's workstations through twisted-pair wire. BTOS Tele Cluster simultaneously supports voice and data transmissions and allows Unisys workstations to coexist with IBM Personal Computers on the same network.

Like its predecessor, the BTOS I operating system, BTOS II permits Unisys's Intel 80186-based workstations to run in real mode, which gives the system s maximum memory-address space of 1M byte, the vendor said. But BTOS II offers the additional advantage of allowing the firm's 80286- and 80386-based systems to exploit more of their microprocessors' computing potential, which has remained untapped under BTOS I.

In theory, BTOS II's expanded support capabilities will allow customers "to do s lot more work than they've done in the past," according to Carl Jolley, manager of computer services for the city of Cincinnati. But in practice, the operating system's short-term impact will depend on the nature of a user's current applications.

"We probably don't have the need to go to larger memories right now, because most of our B20 equipment operates in s stand-alone mode with applications like word processing and spreadsheets," Jolley said. "But as we grow, we may be able to take advantage of the expanded capabilities in the future."

Unisys has positioned the latest release of its workstation operating system against IBM's System/36 and 38 and 9370, according to Executive Vice-President James Unruh. "The product's positioning may be a little more upmarket than expected," said Suzanne Purnell, an analyst who follows the workstation arena for Dataquest, Inc. "But st this point, the IBM products that Unisys is most likely to bid against with its BTOS II workstations are the System/36 and the 9370."

Depending on the workstation model with which it is configured, BTOS II ranges in price from $200 to $450. It is scheduled for shipment in late September. A 12-line Tele Cluster system costs $2,150.

Uccel slims Infoloans unit

DALLAS — Uccel Corp. recently laid off six developers from its troubled integrated loans project, although the vendor said this does not indicate s lessened commitment to Infoloans.

"There were too many people, not enough focus, and it was too difficult to manage," said Donald Steele, general manager of Uccel's Financial Systems Division.

Timothy McCollum, a vice-president st Dean Witter Reynolds, Inc., said he had met with Computer Associates International, Inc. executives, who said they intend to bring some of their development staff into the Infoloans project. Computer Associates had earlier announced plans to acquire Uccel.

McCollum also suggested that the layoffs came about because Uccel has just about used up the $20 million investment it received from Devinvest AG.

Steele, however, said, "We have plenty of our own money to continue investing in this."

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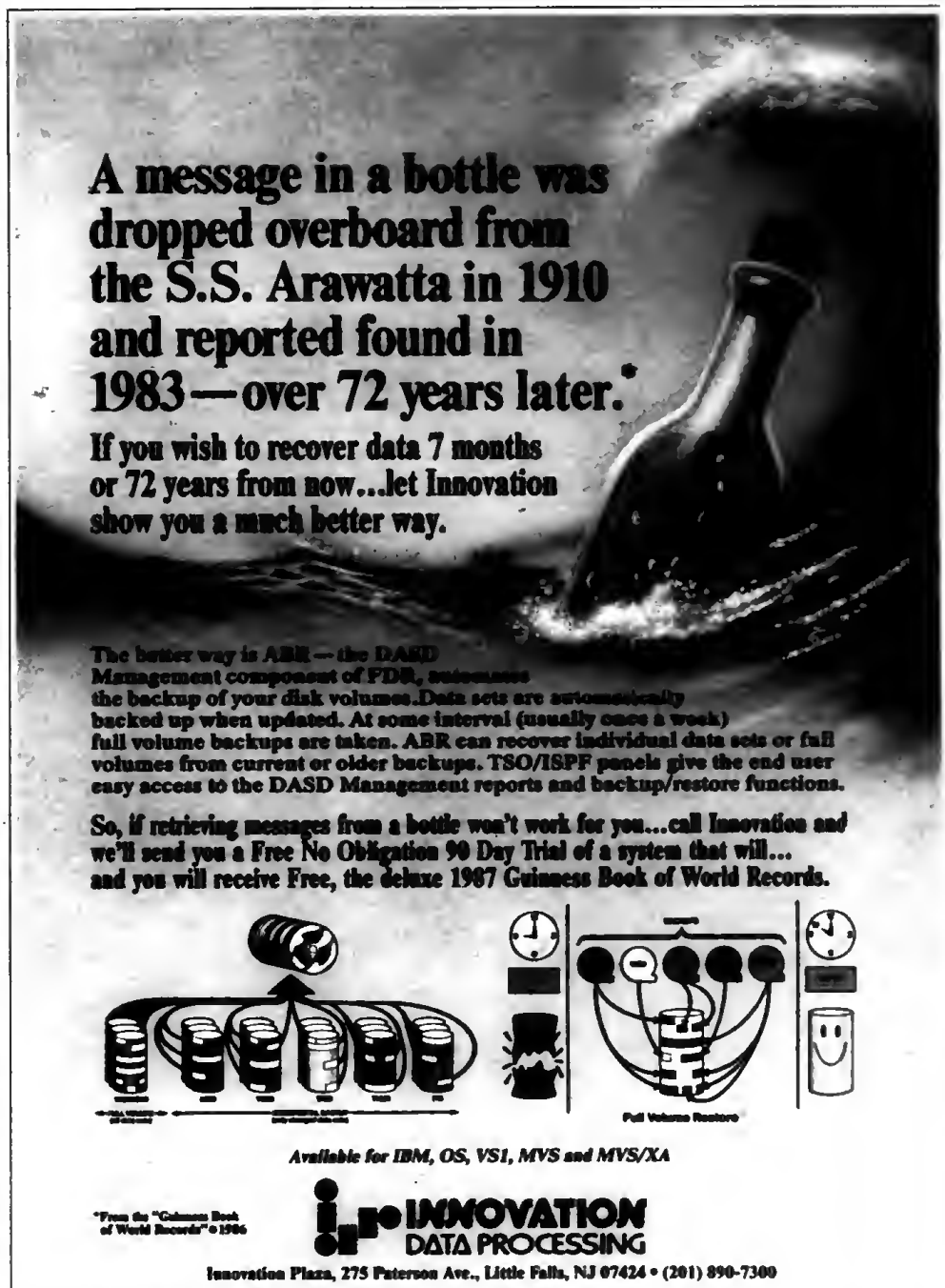

Britton Lee uncorks data base series

High- and low-end machines, integrated manager highlight RISC intros

BY ALAN ALPER
CW STAFF

NEW YORK — Britton Lee, Inc. showcased a new series of 32-bit relational data base machines last week that employ a reduced instruction set computer (RISC) architecture and will reportedly process transactions at more than five times the speed of its current high-end system when they are made available in July 1988.

At the National Financial Computer & Automation Conference here, the Los Gatos, Calif., company also disclosed plans to unveil a new version of its integrated data base manager (IDM) that, when available one year from now, will reportedly support ANSI SQL and IBM's DB2 relational data base management system.

Under Britton Lee's shared data base approach, a dedicated processor is used to off-load data base management functions from the host processor, thereby reducing I/O constraints and providing greater resources for host application processing.

Offers shared access

The dedicated processor provides shared access to data base files stored on large hard disk drives for users working on microcomputers, minicomputers and mainframes.

The data base machine concept, similar to the positioning of the minicomputer as a network server in a corporate information system, offers benefits over a software-only DBMS, noted James Candlin, Britton Lee's vice-president of marketing.

"Software-only approaches usually result in redundant data and higher costs as a percentage of processor consumed," he added.

Britton Lee claimed that its new high-end data base machine — the BL8000 — has an optimal rating of 20 million instructions per second (MIPS) but will operate effectively at a minimum of 10 MIPS.

At those rates, the machine should offer between five and 10 times the performance of the firm's 16-bit BL700 processor using the TP1 benchmark, a standard used to measure financial transactions, Candlin noted.

Acts as cache

The BL8000's architecture, optimized for data base processing, utilizes large chunks of emitter-coupled logic memory to act as a cache for the system's disk storage.

Elements of RISC are used to streamline processing performance, the company noted.

Relative to competitor Teradata Corp. — which has targeted the high-end of the market — Britton Lee is positioning the BL8000 as "a departmental processor," Candlin noted.

Many analysts, however, are not convinced that data base machines will occupy more than a small niche in the data base management marketplace.

Surrounded by high-performance personal computers and technical workstations at one end and mini and mainframe computers at the other, many analysts believe the data base machine may be a trend that will fade away by the 1990s.

Britton Lee's new machines may give the firm some price/performance advantages over general-purpose processors, but, according to Shaku Atre, a consultant in Rye Brook, N.Y., the prospects for a market-share increase are somewhat dim.

No Blue stamp

"One major reason is that it lacks a Blue stamp," Atre said in reference to IBM and its primary emphasis on a software-only data base management approach with DB2.

Aimed at a variety of markets, including financial, telecommunications, government and aerospace, the BL8000 will reportedly support systems running IBM's VM/CMS and PC-DOS and Digital Equipment Corp.'s VAX/VMS as well as technical workstations and minicomputers running various flavors of Unix.

The machine can be connected to the host through an Ethernet local-area network, an RS-232 interface or an IBM block multiplexer channel, the company said.

Three varieties

The BL8000 will be available in three configurations, with disk storage ranging from 1G to 120G bytes and data memory ranging from 16M to 256M bytes.

Base price of the BL8000 with four 439M-byte hard disks is $320,000, while a high-end system with 14 850M-byte hard disks lists for $599,000. A backup 6.2K bit/in. tape drive is also provided.

Britton Lee also introduced repackaged versions of its mid-range machines and brought out a series of low-end processors, including a reconfigured entry-level system.

The BL300 family — previously known as the RS310 — consists of four models featuring 4M bytes of main memory and disk storage capacities ranging from 63M bytes to 3.5G bytes.

Filling a gap

The new machines fill a gap between the firm's previous entry-level machine and its mid-range BL700 family, previously known as the IDM500, noted Don Nammerman, director of product marketing.

BL300 Models 25, 40 and 60 list for $24,950, $49,950 and $90,950, respectively, and include 300M, 400M and 880M bytes of disk storage. A variety of tape backup devices is offered, including a cartridge or nine-track reel-to-reel tape drive.

The reconfigured entry-level Model 20, priced at $17,950, offers 63M bytes of disk storage, expandable to 126M bytes. Including host and dedicated IDM software, the machine lists for $24,950. The previous low-end model was priced at $50,000 — including IDM software — and also offered 63M bytes of disk storage.

The repackaged BL700 Model 40 offers a data base accelerator and disk and tape options as standard features for the same $129,950 price tag as its predecessor.

The Model 60, priced at $204,950, is packaged in the same cabinet as the entry-level BL8000 to provide an easy migration path to the new system, Nammerman noted.

All models will ship in October, the firm said.

Software licenses for the IDM component residing on host systems range from $5,000 for PC-class machines to $60,000 for large mainframes. A license for the relational data base management component, which resides on the BL8000, is $75,000.

In addition to SQL and DB2 support, Version 2 of Britton Lee's IDM software will provide the facilities required for data base sharing among multiple hosts.

Facilities for data base definition and modification, query processing, transaction management, data integrity, security, backup, recovery and data base optimization will also be provided, the company said.

Extensions included

Version 2, which is upwardly compatible with the initial release of the software, will also include extensions for the 32-bit architecture that will be incorporated in all Britton Lee's next-generation data base machines.

The company is also working on a variety of extensions to the relational model, including relational integrity, although it could provide no timetable for availability of those functions.

Version 1 of IDM, installed on about 800 Britton Lee BL700 and BL300 systems worldwide, provided complete SQL and IDL data definition and query management functions, according to Edward Simon, director of product marketing.

Britton Lee is working to provide support for the IBM MVS operating system, the operating system of choice for a substantial number of large mainframe complexes, Candlin said.

Focus interface

As a precursor to providing MVS support, the firm also introduced an interface to Information Builders, Inc.'s Focus fourth-generation language.

Although the interface is currently aimed at IBM VM/CMS environments, a fourth-generation language like Focus, which offers report writing, graphics, spreadsheets and decision support facilities, is becoming a basic requirement of many MVS shops that are running DB2 data bases.

"We wanted to provide the interface to Focus before we offered the MVS support," Candlin explained.

The Focus interface is set to be released in read-only form in October and in read/write form in the fourth quarter, the firm said. Pricing was not disclosed.

The firm also brought out a software interface made by Micro Decisionware, Inc. that is said to convert data between Britton Lee and 24 PC file formats, including Lotus Development Corp. and Ashton-Tate Corp. formats. Called PC/SQL Link, the interface is priced at $5,000 for a 10-PC license.

Spreading out

Addition of the BL300 and 32-bit BL8000 models expands Britton Lee's reach from PC servers to the mainframe level

Model	Relative performance*	Standard disk	System cost
BL300 Model 20	1.0	63M	$17,950
BL300 Model 25	1.3	300M	$24,950
BL300 Model 40	1.3	400M	$49,950
BL300 Model 60	1.8	880M	$90,950
BL700 Model 40	2.6	880M	$129,950
BL700 Model 60	2.6	3.5G	$204,950
BL8000 Model 400	25	1.8G	$399,950

*Britton Lee scale

CW CHART

European pact flies to Texas Air

BY DAVID A. LUDLUM
CW STAFF

Providing a boost to the third largest U.S. airline reservation system, a group of European airlines last week chose Texas Air Corp. over AMR Corp., parent company of American Airlines, as the software supplier for its European reservation system.

Texas Air's System One Corp. subsidiary, the Houston-based operator of the No. 3 U.S. system, will reportedly serve as a subcontractor to IBM, which holds a contract valued at more than $100 million to provide the European airlines with a reservation system they have named Amadeus.

System One and the Amadeus group have also agreed to link their reservation systems, giving 15,000 travel agents in the U.S. and Europe, as well as Africa and Latin America, equal access, according to Texas Air.

The Amadeus group consists of Lufthansa German Airlines, Air France, Iberia Air Lines of Spain and Scandinavian Airlines System, which together handle about 60% of scheduled European flights. Texas Air operates Continental Airlines and Eastern Airlines.

No partnership

Negotiations between the Amadeus group and the U.S. airlines included discussion of the U.S. partner sharing in the ownership of the European system, which is to be operated by a Spanish company jointly owned by the Amadeus group members. But System One will not become an equity partner in the system.

Attention was called to the issue of U.S. partnership earlier this month when three different European airlines with plans to build a rival European reservation system announced that United Airlines, operator of the second largest U.S. system, would join in the development, ownership and operation of their planned system.

American Airlines spokesman Joe Stroop said AMR, which has the No. 1 U.S. reservation system, proposed a share of ownership in Amadeus but did not make a demand and offered a range of terms.

In a prepared statement, System One President Richard E. Murray said the Amadeus group chose his company because its "corporate philosophy and technology promote connectivity of systems, technology sharing and cooperative access to travel information."

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DB2 chokes

FROM PAGE 1

actions, but they also encountered instances of "severe record locking" as they conducted their tests.

Record locking is one of the undefined limits on DB2's transaction-processing capabilities. DB2's technique of record locking was described by one knowledgeable observer as "crude" and by several DB2 advocates as something that one must design around in application building to avoid performance penalties.

As users move DB2 into heavier production use, the constraint of record locking on transaction processing becomes more acute, users and data base consultants said.

IBM said Release 2 of DB2, currently in use, can handle 47 to 50 transaction/sec. for production purposes, but the company has also widely cited the 62 transaction/sec. result from a benchmark by Provinsbanken in Denmark. Earlier this year, IBM urged DB2 customers to attend a Danish conference on the benchmark results as a way of learning what can be accomplished with DB2 in a production environment.

The Schwab benchmark, which tested DB2 in a CICS environment on an IBM 3090 Model 200, used the firm's established Stock Order Entry system without modification for DB2.

'More complex'

"I'm sure the typical Schwab transaction was more complex than the Provinsbanken transactions," said William Inmon, author of the manual *Building Production Systems with DB2* and a senior consultant with American Management Systems in Lakewood, Colo.

Inmon examined the Provinsbanken benchmark and concluded, "The application was very carefully designed, the data was highly denormalized, and the SQL queries were carefully restrained in the amount of data to be accessed." The application executed a simple transaction at a bank automatic teller machine, he said.

The Schwab system in San Francisco is used by brokers taking customer calls to buy and sell stock at a discount. A customer transaction "is not your simple credit card lookup," said Woodson Hobbs, executive vice-president of MIS at Schwab. A typical transaction involved 41 data base calls, five or six of which were updates, Schwab officials familiar with the test said.

The brokerage house processes 1.2 million transactions a day, most of them in a 7½-hour period. "We felt DB2, from an architectural point of view, was what we wanted. But we wanted to make sure its performance was adequate. It wasn't," Hobbs said.

The Schwab benchmark compared DB2 with the data base management system Schwab eventually selected, Applied Data Research, Inc.'s Datacom/DB. Both were tested using IBM's Teleprocessing Network Simulator, which fires a script of transactions against an application.

Hobbs said IBM representatives assured Schwab that Release 2 of DB2 could handle the firm's requirements and that IBM had supplied a team of specialists to gear the DBMS for the benchmark. IBM officials familiar with the benchmark could not be reached for comment.

On the average, Datacom/DB ran at 36 transaction/sec. vs. a rate of 18 transaction/sec. by DB2. CPU usage was monitored, and Datacom/DB accounted for 15% of CPU usage vs. 85% by CICS. In the DB2 test, DB2 accounted for 57% of CPU cycles, compared with 43% by CICS, said Kenneth Gladden, Schwab's director of systems testing.

Several observers pointed to DB2's method of record locking as part of the explanation for the difference. DB2 locks what is usually a 4K-byte page each time it accesses a record, preventing another user from accessing the same record or any other record on the page. The page may contain several or dozens of records that are locked along with the one accessed, explained Thomas H. Sawyer, senior consultant on DB2 operations at Codd and Date Consulting Group in San Jose, Calif.

In addition, a DB2 data integrity feature maintains the lock, even after the transaction is completed, until the application finishes its run or until it receives an order from the application to commit all updates and release the locks. The feature allows DB2 to redo any updates that are started but not completed on account of an abnormal ending of an application, Sawyer said.

The first version of DB2 imposed the locks at the start of an application's run and maintained them until the run finished. The second release, which is the one currently in use, allows programmers to insert commit orders periodically into applications, allowing the records to be released. The change was one of the primary reasons for the performance gains cited in Release 2, said Colin J. White, a DB2 authority and editor of "InfoDB," a San Jose-based newsletter.

'Horribly crude'

Inmon termed the locking method "horribly crude" in the first DB2 release and "just plain crude" in the second release. Locking at the record level rather than page level is more efficient, he said. White noted that the members of Guide, an IBM users group, had made record-level locking one of its priority requests to IBM.

> "WE FELT DB2, from an architectural point of view, was what we wanted. But we wanted to make sure its performance was adequate. It wasn't."
>
> WOODSON HOBBS
> CHARLES SCHWAB & CO.

Datacom/DB, a relational-like DBMS derived from an inverted-list product, employs locking at the record level with frequent checks for commit orders to release the locks, Inmon said.

Schwab officials indicated that no provision has been made to free locked pages of records since the Stock Order Entry system was tested without redesign for DB2. In initial tests with 100 terminals, the locking became so extensive that DB2 crashed, along with CICS. "Essentially, it came down to the way DB2 locks things, [that] is based on page size," Schwab's Gladden said.

Hobbs said Schwab would have tolerated a 10% disadvantage in transaction processing to get the advantages of using SQL and a relational data base. "But a 2-to-1 difference — we couldn't live with that," he said.

Other users said they have seen DB2's response time become less predictable as they increase the number of transactions to a level still far lower than IBM's cited maximums.

"We're moving cautiously. When we get into complex transactions, response time goes down," noted David Smith, a manager of DB2 use at Deere & Co. in Moline, Ill.

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IBM ships publishing kit

Solutionpac weaves Postscript into processor, not printer

BY JEAN S. BOZMAN
CW STAFF

BOULDER, Colo. — IBM recently began shipments of its Personal Publishing Solutionpacs, which contain an expansion board that implements Adobe Systems, Inc.'s Postscript page-description language within IBM's Personal Computer or Personal System/2. IBM is the first vendor to implement Postscript in the processor cabinet rather than in the printer, according to Adobe.

The approach reportedly offers greater speed, the ability to download software revisions through the PC bus, storage of fonts on a hard disk and faster transfer to the printer through a 1.8M bit/sec. printer interface.

The Solutionpac publishing system is available for PC XTs and ATs as well as PS/2 Model 30s. However, IBM said it is not ready to ship Solutionpacs for the PS/2 Models 50, 60 and 80 because of problems in redesigning the Postscript board for use in those machines' different expansion chassis.

Officials would not estimate a shipment date.

The Personal Publishing Solutionpac, including a PS/2 Model 30, an IBM 4216 6 page/min printer, Microsoft Corp.'s Windows, Adobe's Postscript and Aldus Corp.'s Pagemaker, sells for $8,553. The same printer and software package is available as an upgrade kit to an existing XT or AT for $5,793.

The system is based on IBM's new Personal Pageprinter Adapter, an add-in board with 2M bytes of read-only memory, a 10-MHz Motorola, Inc. 68000 32-bit chip, Postscript specifications and a high-speed I/O channel. Data travels from the board to the 4216 printer through a video cable at 1.8M bit/sec., which offers higher throughput than standard 9.6K bit/sec. lines, IBM said.

"The Postscript board takes on the role of a coprocessor," said Damon Trimble, a marketing support manager at IBM. "As soon as the last bit of data goes across the PC's bus, the end user has the ability to use his keyboard and his mouse."

Ports to processor

Adobe Systems cofounder and Executive Vice-President Charles Geschke said the Postscript implementation is the only one that ports Postscript to the processor itself. "All the other implementations are in the printer," he claimed.

IBM, like other vendors, is under license with Adobe to manufacture Postscript chips.

Geschke said the IBM adapter is a modified version of Adobe's Scout controller board, which has been used in Texas Instruments, Inc. and Digital Equipment Corp. printers.

"They took our design and reconfigured it to fit on their PC card," Geschke said.

IBM managers at the independent Publishing Systems Business Unit here last week said the PC-resident Postscript board sets the IBM product apart from the pack of publishing solutions based on PCs.

"IBM happens to offer industry-standard products such as Postscript and Aldus Corp.'s Pagemaker and Windows in our publishing systems," Trimble said. "We put all of that very deliberately on a standard PC platform. But as much as possible, we're going to integrate them in favor of IBM."

Solution limited

Industry analysts familiar with the Postscript implementation say it will serve to speed the IBM system's performance. But Tony Bove, editor of the "Desktop Publishing" newsletter, based in San Francisco, says he believes that the IBM solution is a limited one.

"The 4216 printer is still too expensive a resource for a personal publishing system," Bove said. "At about $4,000, it's almost like buying a car, and it's a resource that can't be shared with other personal computers. This is in contrast to Apple Computer, Inc.'s Laserwriter, which can be addressed by many computers."

Arlene Karsh, director of computer publishing systems market analysis at CAP International, Inc. based in Marshfield, Mass., said the major advantage of the Postscript card is flexibility.

"There is a slight advantage in sending a finished page over a video cable to the printer," Karsh said. "But there is even more advantage in being able to add Postscript additions or extensions through software that is downloaded from a PC disk drive."

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Telenet staking claim to EDI market

BY ELISABETH HORWITT
CW STAFF

OAKLAND, Calif. — Gambling that demand for electronic data services is on the verge of exploding, Telenet Communications Corp. last week entered the market through an agreement to resell Electronic Document Interchange (EDI) services.

The agreement with Sterling Software, Inc.'s Ordernet services division was announced at an EDI conference held here by Mountain View, Calif., research firm Input. The joint venture combines the strengths of two market leaders, analysts said.

Telenet, a subsidiary of U.S. Sprint Communications Co., reportedly has the largest commercial packet-switching network in the U.S. Ordernet was third in EDI service revenue last year, behind McDonnell Douglas Network Systems Co., owner of Tymnet, and General Electric Information Services Co. (Geisco), according to Input.

Both McDonnell Douglas and Geisco offer packet-switching and messaging services, which can be integrated with their EDI offerings. Neither company has been able to make its EDI venture profitable so far, noted Victor Wheatman, Input manager of EDI planning services.

Growth spurt seen

However, he added, both have significantly added to their customer bases this year. Furthermore, Input predicted that the EDI market, including software and services, will see an 88% average annual growth rate, reaching approximately $1.4 billion by 1991.

"I think this is the year that growth will begin climbing steeply," said Telenet director of EDI services Michael Mansouri. "We have done our own elaborate study of intercompany networking strategies, and we think the time is right." Telenet's own projection, less optimistic than Input's, is that EDI revenue will be just more than $400 million in 1991.

While Telenet will resell the Ordernet software and services, Ordernet will market the Telenet network as a cost-effective access link for its customers, noted Ordernet President William Plumb. Until now, Ordernet was accessible only through WATS, dial-up or dedicated 56K bit/sec. channels, he added. But customers will really benefit, according to Plumb, "when we jointly develop software to integrate Ordernet's EDI services with Telenet's electronic messaging."

Bergen Brunswig Corp., which currently uses Ordernet to process and electronically distribute 70% of its purchase orders, is interested in the integration of the EDI service with the hard-copy delivery feature of Telenet's messaging service, according to Michael Selman, Bergen Brunswig's director of corporate systems. This would allow the firm to send electronically processed documents to the remaining 30% of its suppliers that lack the technology for electronic delivery, Selman noted. Telenet will offer users alternate gateways to either Ordernet or to telex and hard-copy delivery systems, Mansouri said.

Bergen Brunswig has little interest in using Telenet's packet-switching facilities to send its business documents to Ordernet, Selman said. "We are a large user; we can justify 56K bit/sec. dedicated lines."

Telenet, which has been expected for some time to enter the EDI market, chose Ordernet as its partner because "it provides more than just a commodity service," Mansouri said. "They process information and generate quality-control reports" designed to ensure reliable delivery of documents, he added. Sterling also has differentiated itself from competitors by reselling EDI transaction data in the form of market analysis reports.

Telenet's EDI service is scheduled to be available in the fourth quarter, the company said.

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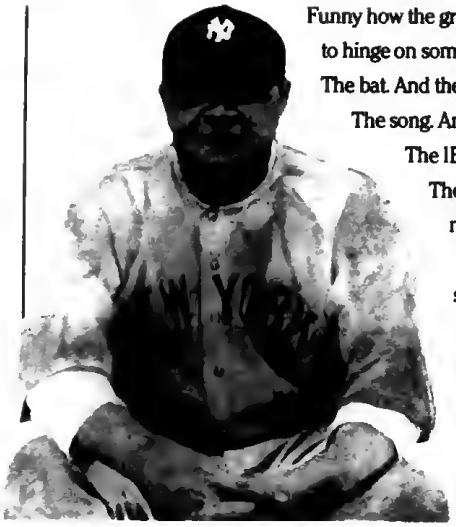

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VMCENTER II FROM VM SOFTWARE, INC.

PC accounting tool works with host

BY CHARLES BABCOCK
CW STAFF

RALEIGH, N.C. — Global Software, Inc. last week announced accounting systems said to work on personal computers in conjunction with related applications on the mainframe.

The PC-based applications, called the Cooperative Processing System, are scheduled to be available late this year at prices ranging from $10,000 to $30,000. They will work with the $75,000 to $130,000 General Ledger and other applications of Global's financial software product line, the company said.

The packages were designed to offload mainframe cycles to desk tops when the processing is appropriate for that level, according to Global President Ronald J. Kupferman.

Software tied via Irma board

The personal computer software is tied to the host via a Digital Communications Associates, Inc. Irma board, IBM 3270 terminal emulation or other standard data transfer link.

Each mainframe package includes an environmental manager that is set at the time of installation to channel communications through the correct teleprocessing monitor and to a predetermined mainframe data base management system.

Fred G. Dilger, executive vice-president of Global, said use of the environmental manager isolates the communications link from the application and will allow Global to take advantage of program-to-program, LU6.2 communications when that feature becomes better established in the marketplace. "The environmental manager isolates the mainframe application from the data base and monitor. It gives me one entry point into the mainframe," regardless of the subsystem environment, he said.

The current PC application set was designed to work under IBM's CICS teleprocessing monitor, which represents the largest share of Global's 2,400 sites.

The first application will be the PC Budgeting package to work with Version 10.0 of Global's General Ledger on the mainframe. PC Budgeting will provide menu selection, windowing and simplified screen manipulation to allow "a more civilized dialogue with the mainframe," Global representatives said.

Cooperative processing versions of fixed assets, general ledger, accounts payable and credit and accounts receivable applications are slated for the PC after the initial package is offered.

Tamperer convicted

BY ADAM STONE
CW STAFF

ROCHESTER, N.Y. — A former Eastman Kodak Co. employee was recently convicted on two counts of computer tampering for twice shutting off the company's telephone lines.

Robert V. Versaggi of Oakfield, N.Y., is one of the first to be convicted under the state's new computer tampering laws, which took effect in November 1986. Those statutes prohibit "the alteration or destruction of a computer program," according to City Court Judge Joseph D. Valentino.

Kodak uses a Tellabs, Inc. local-area network (LAN) running on a Northern Telecom, Inc. SL-100 computer to operate its telephones. Versaggi was found guilty of tapping into the SL-100 through the Tellabs LAN from his home computer and shutting off 4,698 telephone access lines at the Kodak Park facility here shortly after midnight on Nov. 10, 1986. Technicians worked for two hours to restore service at the facility.

He was also convicted of shutting off, in the same manner, all 6,990 phone lines at the Kodak national corporate headquarters, also in Rochester, on Nov. 19, 1986. The lines stayed out for four minutes before the computer restarted itself.

Evidence found in phone bills

When a telecommunications supervisor suspected tampering as the cause of systems abnormalities in October and November last year, he ordered that a script file be installed on the system to monitor activity. Monitor printouts, SL-100 log printouts and Versaggi's telephone bills were presented as the crucial evidence that led to his conviction.

Versaggi's lawyer, Clark J. Zimmermann, argued that issuing the shutdown commands was merely a use of the Tellabs program and not an alteration. Since Versaggi did not rewrite the program or permanently damage it, the wording of the statute did not apply to this incident, Zimmermann said.

Valentino wrote in his decision that he had rejected Zimmermann's literal reading of the law in order to uphold its broader intention "to deter this kind of activity by employees entrusted with special computer privileges."

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Cullinet to launch VAX tool set

BY CHARLES BABCOCK
CW STAFF

WESTWOOD, Mass. — Cullinet Software, Inc. is about to launch an application development tool set, including an application generator, that will work with standard files on the Digital Equipment Corp. VAX.

A preview of the still unannounced product last week indicated that the supplier of the IDMS/R data base management system and related tools to mainframe IBM shops is preparing to move forcefully into the VAX marketplace. Although Cullinet officials declined to name specific products, they acknowledged that Cullinet can be expected to develop VAX versions of many of its mainframe application offerings.

The tool set, called Knowledge Build, will allow programmers to develop applications in Cobol, Fortran or Basic while using DEC Record Management System files. A later release is expected to add the C language and Cullinet's fourth-generation language, the Application Development System (ADS).

In addition, the same tools and the application generator will be included in Cullinet's relational data base management system for the VAX, IDMS/SQL, when it is announced this fall. The DBMS will use SQL as its data access and manipulation language.

The five tools provide data definition, screen painting, menu maintenance, report generation and code generation. "This is a very directed, menu-driven application development system," said Ann Thomas, a Cullinet sales representative.

User definitions

The tools make use of an underlying set of rules that allows data to be defined, screens to be painted and menus to be built in response to user prompts and short data entries. Screens can be constructed so that fields requiring telephone numbers to be entered will have automatic cursor jumps over the dash in the oumber. Fields requiring an employee name will automatically capitalize the first letter of each name, Thomas said during a demonstration of Knowledge Build.

A data dictionary checks and enforces data definitions, preventing a user from entering data that is inconsistent with the type defined for the field.

Users can invoke Help screens by hitting function key 2, a process typical of many VAX systems. "We tried to follow VAX conventions as much as possible," said Steve Romagna, assistant product manager.

The tool set, when available with IDMS/SQL, will include SQL, precompilers for preprocessing queries and Fastinfo, an end-user tool for building ad hoc queries through a series of windows.

Knowledge Build requires Version 4.4 of the VMS operating system.

A similar set of personal computer-based tools is currently being built to use a version of ADS called ADS Plus, according to Rogmagna.

Cullinet officials point out that when an SQL-based version of IDMS/R is available, in 18 to 24 months, Cullinet will be offering SQL-interfaced development tools on PCs, the VAX and mainframes.

OS/2 veil

FROM PAGE 1

made available.

-A major stumbling block for Unix has been its difficulty, which a graphics user interface would help alleviate. The availability of a Unix version with a graphics user interface shell would also help machines based on Intel Corp.s 80386 chip to "sneak into the single-user technical workstation market," where OS/2 is expected to be strong, Sribhibhadh said.

With the disclosure of the Presentation Manager delivery schedule, both users and software developers can more easily plan for the implementation of OS/2. Neither IBM nor Microsoft has previously announced a shipping schedule for the product.

At a recent analysts' meeting, William Lowe, president of IBM'a Entry Systems Division, denied reports that the Presentation Manager is behind schedule. Lowe said the project is ahead of schedule but declined to say what the schedule is.

Flying blind

Without fairly precise knowledge of the schedule for the Presentation Manager, users cannot determine what type of software will be available for OS/2 and have difficulty deciding what hardware configuration they will need to run the bulk of OS/2 applications.

If the Presentation Manager ships in close proximity to OS/2, the bulk of OS/2 applications will require the Presentation Manager and will need at least an Intel 80286 machine equipped with a high-resolution graphics adapter and monitor, a mouse and additional memory.

Were the Presentation Manager to ship long after the OS/2 kernel, however, the bulk of applications would remain character-based and would not need high-resolution graphics or a mouse. They would also require less memory.

Software vendors contacted last week said they plan to place the bulk of their development efforts toward Presentation Manager-based applications and will benefit from any closeness in ship dates.

"It makes sense to do one port on any piece of software, because it is very expensive each time we gear up an effort, as well as time-consuming," said Ron Posner, president of Ansa Software.

Despite what may be viewed as an aggressive delivery schedule by IBM and Microsoft, many MIS and micro managers remain concerned that both OS/2 and the Presentation Manager are still too far off to mean much to their corporate computing strategies.

"There isn't a lot I can do with that information. It's not bad news, but it falls under the category of interesting. There is nothing I can run with it today," said Jeff Ehrlich, manager of product technology for General Electric Corp.'s Information Systems Division.

"If they are talking about just accelerating the release of the Presentation Manager but oot all the other extended capabilities in OS/2, like [IBM's] Systems Application Architecture, which is essential in developing code we write in-house, it's not much help," said Robert Corr, director of technology planning for the Dealer Systems Division at Electronic Data Systems Corp.

Developers wary

Software developers too said they are skeptical about the value of an earlier release of the Presentation Manager, with many hedging their bets by offering programs that require the OS/2 kernel. Lotus Development Corp., for instance, has already announced a character-based version of 1-2-3 for OS/2 and will later release a version specifically for the Presentation Manager.

Others said they are skeptical over whether Microsoft and IBM can deliver the Presentation Manager on time.

"Every developer has to place their bets today on what approach they are going to take [to OS/2 and the Presentation Manager], said Brad Silverberg, Borland International'a vice-president of engineering. "IBM and Microsoft will have to present some evidence that things are going well for this to mean anything."

Computerworld Senior Editor Doug Barney and West Coast Bureau Chief Jeffry Beeler contributed to this report.

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FCC expected to further deregulate AT&T

Large users fear abandoning rate-of-return method would boost private-line rates

BY MITCH BETTS
CW STAFF

WASHINGTON, D.C.— The Federal Communications Commission, at its next meeting on Aug. 4, is expected to propose a complete overhaul of the way it regulates AT&T's interstate long-distance rates.

The deregulation measure promises to make AT&T a more profitable company, but AT&T's largest customers are concerned it could lead to price increases, particularly for private-line services, according to several industry analysts.

Analysts recently predicted that the FCC, led by Chairman Dennis Patrick, will issue a proposed rule abandoning the traditional form of rate-of-return regulation, replacing it with a scheme allowing AT&T some pricing flexibility under an overall price cap.

In essence, the FCC will be scrapping the ceiling on AT&T's profits in favor of a ceiling on AT&T's interstate long-distance rates, according to George R. Dellinger, a telecommunications analyst at Washington Analysis Corp. He said the FCC is sympathetic to AT&T's contention that it faces several competitors in the long-distance market and thus should be deregulated.

Emulating Brits

Dellinger said the FCC's proposal may resemble England's regulation of British Telecommunications PLC, which uses a rate formula pegged to the consumer price index, minus 3%. For example, in a year in which British inflation is 5%, British Telecom can raise its prices a maximum of 2%.

The new regulatory model would "permit [AT&T's] costs to decline more quickly than rates, which would allow profit margins to expand," Dellinger said. That would give AT&T's interstate long-distance profit center a $500 million earnings boost, he predicted.

The FCC proposal, which will be subject to public comment before becoming a final rule next year, will be controversial enough that it may provoke challenges in Congress and in court, sources said.

The idea is being greeted with skepticism and suspicion by large network users [CW, April 13]. "There's a lot of ambivalence in the user community about AT&T deregulation," said one users group's attorney, who requested anonymity.

The source said that while AT&T lobbyists promise large users that pricing flexibility means they can get special discounts for long-term contracts, users are concerned that they also could be hit with price hikes for private-line and other services.

FCC officials, who in December 1986 supported deregulation of AT&T's packet and contract services, recently hinted that they will propose a complete replacement for rate-of-return regulation on AT&T in early August. The FCC has already released research papers suggesting that it is legal and appropriate to abandon the rate-of-return model.

The FCC adopted rate-of-return regulation in 1967, which required AT&T to set rates at levels that would cover properly allocated costs and earn a return on capital falling within an FCC-specified profit range, now 12.2% to 12.7%.

The driving force behind the FCC's forthcoming proposal is the contention that traditional rate-of-return regulation has numerous flaws. Critics have said it gives regulated companies a perverse incentive to inflate costs because they earn a guaranteed profit on expenses; it is too burdensome for companies and regulators to administer, delaying the introduction of new services; it creates an incentive for the regulated company to shift costs from unregulated businesses to the regulated business; and it regulates long-distance rates only indirectly.

Rate-based system 'outmoded'?

Last week, the Reagan administration's National Telecommunications and Information Administration (NTIA) released a report urging federal and state regulators to scrap the "outmoded" system of rate-based regulation.

The NTIA report recommended that all competitive telecommunications services be fully deregulated and all services that lack alternative suppliers be subject to a "modified social contract" form of regulation, which establishes a rate cap and allows some pricing flexibility.

"We have recommended the virtual deregulation of AT&T," said Alfred C. Sikes, who heads the NTIA, because the long-distance market is competitive.

MCI Communications Corp. also supports deregulation for AT&T. This is said to be in part because it believes that the FCC's use of rate-of-return regulation to push down AT&T's long-distance rates has hurt MCI's financial position [CW, March 9].

Slew of intros marks Siggraph

BY ALAN J. RYAN
CW STAFF

ANAHEIM, Calif. — ACM Siggraph '87 opens its doors today here to a projected 25,000 attendees. New products on display are slated to include low-end workstations, graphics software, graphical user interfaces, videographics boards, controller cards, paint packages and animation packages.

Among the products scheduled to be demonstrated at the show are the Iris 4D/60 Turbo Option from Silicon Graphics, Inc. and the PXCL 5500 Turbo Option from Natick, Mass.-based Prime Computer, Inc. The Turbo Option, announced by both companies last week, was jointly developed by Silicon Graphics, Prime and MIPS Computer Systems, Inc. in Sunnyvale, Calif.

The floating-point and integer computing performance upgrade was designed for Silicon's reduced instruction set computing-based Iris 4D/60 Superworkstation and for Prime's PXCL 5500. The Turbo Option, which sells for $7,500 from both companies and will begin shipping next month, is a CPU upgrade to a 12.5-MHz 32-bit CPU coupled with a 12.5-MHz floating-point coprocessor. It includes a high-speed dual-cache design and up to 16M bytes of on-board CPU memory. Also announced last week were price reductions on the Iris 4D/60 workstation and PXCL 5500; both were cut from $74,900 to $64,900.

Silicon Graphics also will demonstrate a low-end workstation to compete against Sun Microsystems, Inc. and Apollo Computer, Inc. workstations. The Iris 3115 will sell for $24,900, the company said.

Bala Cynwyd, Pa.-based Pictureware, Inc. is slated to demonstrate its updated version of Picturepower. The software package incorporates photographs into data bases and can display those photos in either gray scale or color, according to a spokeswoman. The program is now compatible with the Hewlett-Packard Co. Laserjet printer and sells for $940.

Also making its debut from Pictureware will be a hardware compression package coupled with Picturepower. Called Picturepower HC, the package reduces the amount of data base space required for Picturepower by a 10-1 margin, the spokeswoman said. The package will sell for $3,500.

Slide Manager, a generic-type program for slide cataloging that records a written description and the image from the slide onto a data base, will be announced by Pictureware. It will sell for $900 and is compatible with Ashton-Tate's Dbase Plus.

Productivity Products International in Sandy Hook, Conn., is set to introduce a graphical user interface construction package for the development of iconic user interfaces on bit-mapped display products on Tuesday. The object-oriented programming tool is written for C.

Nova Graphics International Corp. in Austin, Texas, said it will announce the Nova CGI, a firmware-based product that reportedly conforms to the Computer Graphics Interface standard. Also to be announced will be Nova's joint-marketing agreements with the Display Products Division of Calcomp, a Lockheed Company, and the Microcomputer Division of Motorola, Inc. in Tempe, Ariz.

AT&T's Electronic Photography and Imaging Center is slated to demonstrate its Vista videographics board at Siggraph. The single-slot personal computer board includes 4M bytes of on-board CMOS video random-access memory, multiple addressable resolutions and a 16-million color palette, the vendor claimed.

Kontron Datasystems in Mountain View, Calif., said it will unveil its 7000CB, an IBM Personal Computer AT-based graphics controller card that contains one or two Advanced Micro Devices, Inc. 95C60 Quad Pixel Dataflow Managers. Prices start at $2,995.

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EDITORIAL

CASE advantage

The "workstation wars" of recent months may present a hidden opportunity for an unlikely group of MIS professionals — software developers. With workstation prices plunging to below $5,000, many sites may be encouraged to experiment with the hot new technology called computer-aided software engineering. What they may find, however, is that CASE is more glitter than substance.

CASE products have drawn raves from some experts for helping developers computerize the laborious task of modeling data and documenting program flow. Most contain validation features. Several enforce one or more life-cycle methodologies. Nearly all feature elegant graphical interfaces.

Unfortunately, CASE technology is still relatively primitive. Most tools have grown up around the need to automate the manual process of drawing data flow or structure charts. Protyping aids, libraries and validation tools have been added, but mainly as extensions to the graphics core. To achieve real software engineering — not just design and analysis — users require much more.

MIS professionals need to start with tools that help model the organization and create and enforce related standards for data and programs. A code generator should accept those diagrams and turn out Cobol programs that can be maintained by hand or regenerated from specifications. All this needs to be accomplished from a flexible, friendly interface that does not require rigid adherence to a particular methodology.

Pieces of this puzzle are now becoming available, but the picture is still incomplete. One manufacturer has tied a host-based code generator to a workstation CASE tool but produces programs only in a proprietary language. Others have leveraged networking and cataloging into useful documentation aids for teams of developers but have failed to make the link to program generators. Still others have built data dictionary-oriented design tools but have tied them to rigid methodologies.

Much good work is now being done in this area. Knowledgeware, Inc. is tying its CASE environment to the Gamma code generator recently purchased from Tarkenton Software, Inc. Bachman Information Systems is working on CASE methods assisted by artificial intelligence. Index Technology Corp. has struck deals with several code generator developers. Cortex Corp., which has gone far in resolving the code generation problem with its Corvision and Application Factory products, is developing a port for IBM mainframes that will produce Cobol code.

However, these and other efforts are still in the development stage. While it is encouraging to see so much activity in the CASE arena, MIS departments should seize the opportunity to purchase cheap, powerful workstations and put them to work in CASE applications on smaller projects. The kind of feedback that such use generates is the only tonic for helping CASE tools overcome their current weaknesses.

LETTERS TO THE EDITOR

Another cure

In "A cure for C-sickness" [CW, June 8], William Zachmann continued to support the myth that personal computers are less expensive than multiuser systems.

He summed up this myth with the following naive and absurd assertion: "Contrary to what many still think, the result will be a devastating reduction in the demand for traditional mainframe and minicomputer systems. The vastly superior price/performance ratios in microprocessor-based systems, like personal computers, spell big trouble for vendors of traditional multiuser systems. Increasingly powerful PCs, linked by means of local-area networks and supplemented by network servers of various types, offer a far less expensive, more flexible way to build enterprise systems than traditional systems do."

What makes this kind of statement so ridiculous is the pompous, almost self-righteous context in which it is given. Zachmann gives no facts, information or data to support his statement.

Over the years, I have seen this technology-driven mentality assert itself over and over again in the information systems field. One does not see a similar disregard for economic analysis and facts in other fields such as marketing, manufacturing, engineering, accounting and administration.

Based on my experience in building and maintaining multiuser mainframe systems, I have never found a PC-based system that could compete costwise with a properly developed and maintained multiuser mainframe system.

The output products of any computer-based information system are the same regardless of whether the system runs on a microcomputer, minicomputer or mainframe.

Some people in our business like to talk about cost per million instructions per second, per million bytes of storage and per unit of memory. This data is useful to systems executives in evaluating purchase or lease trade-offs, but it is utterly useless when communicating with an end user.

The electronic data processing industry does itself a disservice by substituting jargon, innuendos and voodoo economics for the cold, hard and rational economics of computing.

Zachmann suggested a cure for "C-sickness." I recommend Zachmann take a cure for the voodoo economic malaise that afflicts him.

J. Robert Riggs
J. Robert Riggs Co.
Dallas

This week in history

July 25, 1977
A special police unit organized more than a year ago to train police in Tallahassee, Fla., in DP crime detection has yet to train anyone because of a lack of interest from the business community. "It's something the business community would rather not address until something happens," a special agent says.

July 26, 1982
The People's Republic of China has greatly increased its efforts to illegally obtain Western electronics technology in the past year, due primarily to increasing frustration at U.S. export controls and the resultant delay in technology acquisition, American military intelligence agencies say.

Right to the source

I would like to clarify the source of the IBM Personal System/2 performance data that appeared in a chart in the Microcomputing section [CW, June 15].

National Software Testing Laboratories, Inc. designed and conducted a series of 26 application-based benchmark tests on 22 hardware systems, which was included in National Software Testing Laboratories' April issue of *PC Digest*. These benchmarks are now considered the state of the art and are being used as a standard.

The source incorrectly referenced the chart used in the section as a CW chart. The significance of this chart was to highlight the impact of the combination of hardware speed and disk caching on certain types of machines.

National Software Testing Laboratories is well known for its work in the area of microcomputer comparison testing, particularly in the area of performance, and also publishes the *Software Digest Ratings Report* and *PC Digest*.

National Software Testing Laboratories is currently preparing an updated systems performance report for *PC Digest*.

Michael D. Stern
President
National Software Testing Laboratories, Inc.
Philadelphia

The importance of acting your wage

To be treated like a professional, work like one

READER'S PLATFORM

ROBERT CROSS

Each new year brings the hope that this year will be the one in which data processing will take its place beside other professions, such as medicine, law and engineering.

Many people already consider DP a profession, and you can receive several certificates in the field. However, the handing out of certificates and calling ourselves professionals does not make us so.

There are certainly professionals in data processing, but is the field truly a profession or just an occupation?

The U.S. Labor Department tends to classify DP jobs as clerical or technical as opposed to professional.

MANY of today's programmers are more interested in the rights to creativity than in getting the job done well and on schedule.

DP has been maligned in the past few years and often justifiably so. In fact, DP is often its own worst enemy.

There are no areas in DP that can go unblamed, but I have decided to pick on programmers in this column because they are the most visible.

Because of the huge demand for DP services, many people were hired as programmers that should not have been. When such an employee turns in less or inferior work, co-workers often adjust their output downward to match. This pattern, of course, lowers the productivity of the whole data processing organization.

Salary debate

At lunch one day, several DP professionals and myself were discussing a newspaper article about the salaries of another occupation. We were debating whether data processing salaries should be higher, lower or equal to the other occupation.

One person at the table shocked us. He actually said that he thought that most programmers were highly overpaid.

This statement caused quite a stir. He explained that he had observed — and we agreed — that a great majority of the programmers he had worked with were not turning out the quantity and quality of work that would justify their salaries.

There are far too many programmers in this country who are not effective at developing and implementing programs. We had all met programmers who had several years of experience in Cobol programming but could not debug the simplest error.

In data processing shops across the country — and across many positions — a growing percent of DP professionals are taking a more casual attitude toward their work. For them it is just a job from 9:00 to 5:00, some place to be five days a week and get paid for it. While the number of hours spent at work is not a measure of being a professional, it does reflect one's attitude about his job.

Cafeteria food

The conversation in DP shops is turning from new products and ideas to how bad the food is in the cafeteria or how the local high school football team is doing. These subjects may be interesting and should be discussed, but too few DP professionals express any interest in what is going on in data processing.

Programmers grumble about missing their bowling last night because a dumb user entered bad data into the system.

When something goes wrong with a program, the programmer will often blame everything from bad specs to computer glitches before admitting that the problem may be in the code.

Many of today's programmers are more interested in the rights to creativity than in getting the job done well and on schedule.

In order for data processing to obtain a professional status, all of us in the field must strive to be professionals ourselves, then look for ways of helping others raise the standards higher. If people don't treat us as professionals, maybe it is because we haven't done enough to raise the work standards by which we are measured to the professional level.

Data processing should be considered a profession — it requires great skills to do it right. However, too many people are getting by today without doing their best.

Cross, a data processing veteran of 17 years, is the general manager of C-Kaay, Inc., in San Francisco.

What is meant by 'performance?'

JOHN BARNES

Whatever it is, it's worth a lot. It's a selling point for general office software, spoolers, microcomputers, networks, motherboards, data bases, accounting software, high-resolution graphics boards, compilers and programs. It's better if it's "high" or "peak," and you may want it "enhanced" or simply "more."

Everyone else's product gives up something to get it — reliability, cost, upgradability, ease of use, power, cost-effectiveness, manufacturer support, simplicity or speed — something has been traded off to get it. Except in our product, which now offers it without any sacrifices whatsoever.

"It" is performance, of course. It and "power" are probably tied for the most overused and underexplained terms in the computer industry's advertising lexicon; like "power," it obeys Humpty Dumpty's Law — "When I use a word, it means exactly what I want it to mean, no less, no more."

Barnes is the Pacific Northwest Area Manager for ADG, a high-tech marketing organization based in San Pedro, Calif. His first novel, *The Man Who Pulled Down the Sky*, was recently published by Congdon & Weed.

The response is to give up on the word: Performance, like "power" and "high-tech," seems to be an elastic word, which turns out to mean "good." So a "high-tech power performance widget" (advertese) is a "real good widget" (English).

Indeed, in my brief and not particularly scientific survey, about half the ads that used "performance" used it that way. Others used it like "power" — "performance" is anything the product does well or has a lot of. For example, "We've got the performance. SPRI can cut your spooling time by up to 60% . . ."

Shorthand

That brings up another possibility. Is "performance" shorthand for "the ability of the product to do what you bought it to do?" And what did you buy it to do?

In other ads, performance appears to be a combination of qualities. "You get more performance from the AST Premium/286 AT-compatible personal computer with its 10-MHz processing speed and true zero-wait-state operation." "Version 2.0 gives you absolutely the best combination of user conveniences, power, efficiency and speed in the industry."

"Power" is just a list-lengthener, but they really are saying something about Version 2.0 here. It's fast, efficient and convenient — all three, with the implication that some competitors may be one or the other. But Version 2.0 is the all-around champ, the triathlete of its class.

Or look at another ad: "High-speed data retrieval and access . . . just two benefits of using Raima's network model DBMS, DB Vista. Combine these design benefits with those of C — speed, portability, efficiency — and you begin to understand DB Vista's real measure . . . performance."

This ad begins to make some sense. A performance car not only goes fast, it also steers well. High-performance bearings last longer and run smoother. So if performance means anything, it means the ability to do several different desirable things well.

And if that's what it is, then it's a concept we haven't seen enough of.

Aircraft designers talk about a "performance envelope." Within the existing technology, you trade one good thing (say fuel economy) to get another (an operational ceiling) or some combination of good things (top speed and rate of climb).

Products that are close to the edge of the performance envelope — that is, they lose the minimum possible X to gain the maximum possible Y — are "high-performance" or "state-of-the-art"; products that stretch the performance envelope are "innovative" or "advanced." Better performance, then, is defined as reaching combinations of qualities that had not previously been available.

Where are the equivalent trade-offs in hardware or software design? A few are established, and others exist as rules of thumb — user friendliness, for example, often sacrifices response time and storage. But does anyone have a real map of the performance envelope of his particular field?

It wouldn't be a bad thing to look into, and not just because it would make the claim of "high performance" something besides an advertising slogan (though that would be nice all by itself). However, because in this present confusing period, when the "cutting edge" seems to be cutting in all directions at once, it might help us all decide what's next, what's vital, what we want to build or need to buy.

The trouble, in short, is not that "performance" is meaningless — but that we aren't listening to what the word can tell us.

CHRISTOPHER BING

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But once you get your hands on these products, the differences are dramatic. It's the craftsmanship in designing, building, and assembling quality components that differentiates a master's instrument from a beginner's.

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With this kind of performance, INGRES attracts a lot of new customers. But it's our reliability and support, that keeps them. INGRES delivers such a high level of satisfaction that 99% of our customers stay with us, year after year.

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SOFT TALK

Charles Babcock

Fortran 8X tug-of-war

In watching another round of the standard-setting process, one is struck by the inherent tension within it. Serving on an ANSI committee is something like being part of a crew building a suspension bridge. The group must harness potentially destructive forces in order to accomplish a social good. When the outfit has no blueprint, as in the process of setting standards for computer languages, the task is accompanied by apprehension and debate.

The most recent example is the effort of the ANSI X3J3 Committee to set a new standard for Fortran. It has been 10 years since the Formula Translator language was revised; its predecessor, Fortran 77, took 11 years to surface after the original ANSI Fortran 66. What was envisioned as a five-year, periodic review process has doubled for both Fortran and Cobol.

One of the reasons for these protracted discussions is that when an ANSI technical committee convenes, it must hear

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Beta-test user likes new Roscoe

Performance gains not verified for ADR program development system

BY CHARLES BABCOCK
CW STAFF

PRINCETON, N.J. — A new release of Applied Data Research, Inc.'s (ADR) on-line program development system, Roscoe, received praise from a Seattle beta-test user for several of its enhancements. But its claimed performance gains remain untested at the Washington insurance firm.

"ADR is coming up with a more unified approach to data set management," said Michael D. Murray, MVS systems programmer at Washington Mutual Financial Group. But he added that it was premature to pass judgment on a claimed 50% reduction in I/O editing and a claimed 40% reduction in CPU cycles for string searches. His firm has not put enough users on the new release to test its performance, he said.

Release 5.5 of Roscoe, a development system with an installed base of 2,000, includes a new user interface, simplified access to IBM OS and MVS data sets and dynamically defined program function keys, ADR spokesmen said.

Murray said a programmer using Roscoe no longer has to go through a cumbersome data set import/export technique while developing an application. Through a menu-selection process, the programmer can peruse partitioned data sets and attach to one with which he wishes to work. The data set can be placed in his active work space blocks through a COPY command, Murray explained.

Time saver

Previously, the same procedure required perusing a list of partitioned data sets outside of Roscoe, importing one to the programmer's active work space, which would wipe out any earlier contents of the work space, and entering a Roscoe session to see if it was the desired set. If not,

Continued on page 23

Test tool gets CICS support

SUNNYVALE, Calif. — Boole & Babbage, Inc. recently said its Cobol testing and debugging utility is now supported under the IBM CICS environment.

Extended Productivity Facility (XPF)/Cobol Release 3.0.0 is currently available at a base price of $22,500. Release 3.0.0 provides for interactive testing for multiple users under CICS 1.6 and 1.7, the vendor said. Additionally, it offers an interface to IBM's ISPF that reportedly makes ISPF facilities available to programmers for test sessions.

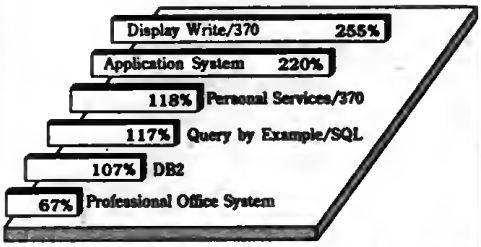
Boole's XPF/Cobol, which supports both IBM's VS Cobol and VS Cobol II, was designed for development and maintenance of Cobol programs in the IBM MVS and MVS/XA environments. Under CICS, XPF/Cobol is compatible with most standard data base management systems, including IBM's DB2 and IMS and Cullinet Software, Inc.'s IDMS, the company said.

In addition to CICS support, the latest release is said to offer improved debugging techniques.

Data View

IBM's fastest growing information center products

Display Write/370 and Application System, IBM's decision support system, lead the list of mainframe software for information center users



INFORMATION PROVIDED BY CRWTH COMPUTER COURSEWARES
CW CHART: MITCHELL J. HAYES

TI slides out CASE system

DALLAS — Texas Instruments, Inc. is shipping the first two pieces of its computer-aided software engineering (CASE) system for mainframe production applications.

The front-end personal computer-based tools use a James Martin-Karma McClure diagramming method to graphically represent applications. The meaning of the symbols used in the diagrams, data definitions and other system definitions are stored in a mainframe encyclopedia for use by the developers. TI spokesmen said an application

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Inside

- **VM/CMS Unlimited offers performance monitor for Focus. Page 22.**
- **Prime ports Intellect natural language system to its hardware. Page 23.**

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*Emc² supports its own super economical, multi-user environments to vastly enlarge the population that can use it. VAP is a special VTAM application for MVS and VSE. FIVS is the multi-user Fischer International Virtual System for VM.

VM/CMS unveils Focus utility

BOSTON — VM/CMS Unlimited, Inc., a maker of utility software for the IBM VM operating system, recently released a performance monitor utility for Information Builders, Inc.'s Focus fourth-generation language. The software company said it will also offer a security facility, called Autolink, for minidisk access.

CMAP/Focus is VM/CMS Unlimited's first product designed to work with a third-party software vendor's product. It is intended as a companion product to the firm's Command Monitor/Analysis Package (CMAP), which monitors IBM Conversational Monitor System (CMS) user activity. CMS is a teleprocessing monitor for the VM operating system.

The product for Focus will allow system managers to collect and record usage of this Information Builders data base and fourth-generation language environment.

CMAP/Focus carries a $1,000 annual license fee, and CMAP, which has a $3,000 annual license fee, is required.

Autolink provides end users with improved minidisk access, according to VM/CMS Unlimited spokesmen. It replaces minidisk user passwords with rules that enable users to set up parameters of their minidisk usage. It has an annual license fee of $2,500. Both CMAP/Focus and Autolink are available now.

Fortran 8X

CONTINUED FROM PAGE 21

from both the best advocates of additions to the language and the conservators of its existing state. In the debate over the upcoming Fortran standard, presently dubbed Fortran 8X, one compiler vendor who was not a member of the committee complained: "The charter of the committee is to validate and standardize existing practice. Why are they inventing new features?" This is the opinion of one who views standard setting as an inherently conservative process.

Often, this debate reflects self-interest. Consultants, academic experts and others who can experiment with the language confront those who must produce compilers conforming to the standard. Somewhere in between is the user, whose interest lies in both camps.

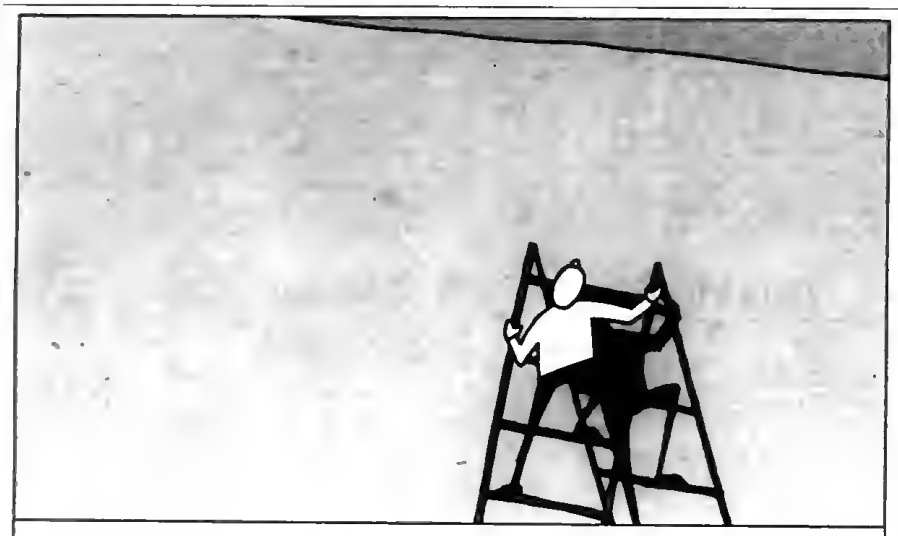
In the Cobol 85 debate, the users fell into the conservative camp because the version of Cobol initially reported out of committee contained features that would be incompatible with the existing library of Cobol applications. After retreating in the public review process, the modernizers on the ANSI committee fought back with the addenda process — a way of adding revisions to Cobol a step at a time.

In that debate, Jerome Garfunkle, an author and consultant on Cobol, is an advocate of adding Boolean, or bit-level, data handling to Cobol. Lawrence Madison, director of data processing at The Travelers Insurance Co., wants to keep Cobol simple. "The business community is better served by not having bit-fiddling," he says.

And so the debate continues. In the case of Fortran 8X, it is difficult to characterize the opponents as either conservatives or modernizers, since they are evenly divided between demanding more and demanding less in Fortran. The opponents include key compiler producers IBM, Digital Equipment Corp. and Unisys Corp., but the supporters also have their share of compiler producers: Cray Research, Inc. and Control Data Corp.

With the public review process likely to commence soon, users would be well-advised to study the Fortran changes and decide for themselves whether the mix offered by X3J3 is what they want.

Babcock is *Computerworld's* senior editor, software & services.



The problem with most 4GLs is they're finished before you are.

And where does that leave you?

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If so, try INFORMIX®-4GL.

Never again will you have to switch to C or COBOL to truly customize your application. Instead, INFORMIX-4GL provides an all encompassing syntax for every aspect of your application building.

So once you're programming in INFORMIX-4GL, you never have to leave it. And considering all it can do, you may never want to.

Now, for instance, you can write in just ten to twenty pages of 4GL code, applications that would take hundreds of pages with C.

That's because INFORMIX-4GL was designed from the start to be an application building language. It's built around the full implementation of ANSI Standard SQL. And features Custom Screen Generation, Custom Menu Building, a built-in Report Writer and Windows.

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TI system

CONTINUED FROM PAGE 21

generator capable of producing Cobol code from the diagrams will be introduced later this year.

The product line has been dubbed the Information Engineering Facility, and its initial two products are the PC-based Analysis Toolset and Mainframe Encyclopedia, priced at $9,400 and $70,000, respectively.

Although many CASE diagramming, analysis and design tools already exist, TI claimed its tools will be integrated by the underlying encyclopedia and will cover the software life cycle.

They will also be designed to produce applications for IBM's MVS operating system and its major transaction processing subsystems: IMS DC working with IBM's DB2 relational data base management system, TSO/DB2, CICS/DL/1, CICS/DB2 and IMS DB/DC, said Bob Bledsoe, a TI spokesman.

The tool set itself will run under MVS and IBM's TSO and will support IBM's ISPF Version 2 and use of files from DB2, TI said.

Future pieces of the product line, in addition to the application generator, are expected to include a design tool set, a planning tool set and a data base generator. The tool sets will be IBM Personal Computer AT-based products running under Microsoft Corp.'s MS-DOS 3.1 or higher, while the data base generator, like the encyclopedia, will be used on the mainframe, the vendor said. No delivery schedule was announced for the succeeding tool sets.

SOFTWARE NOTES

Prime to get Intellect; Excelerator honored

Prime Computer, Inc. in Natick, Mass., and **Artificial Intelligence Corp.** in Waltham, Mass., have agreed to port Intellect, a natural language query and reporting system, to all Prime hardware, officials for both companies said.

Integrity Solutions, Inc. in Denver has regained the rights to its product lines, formerly marketed by **Sterling Software, Inc.**, under an exclusive agreement. Integrity Solutions produces three data recovery and backup products as well as a journal management system that are installed at 300 sites, according to company officials.

Excelerator was named **Software Product of the Year** by the American Federation of Information Processing Societies, an award sponsored by *Fortune* magazine. Excelerator is a computer-aided software engineering analysis and design tool from Index Technology Corp. in Cambridge, Mass.

Have you ever hired a programmer who turned out to be less proficient than advertised? **Teckchek** from **Bookman Consulting, Inc. Software Development** offers a way to screen job applicants. Teckchek can test for proficiency in IBM Cobol, Cobol II, VSAM, CICS, SQL/DS and DB2 as well as others.

Convex Computer Corp. will market Oracle Corp.'a **Oracle** relational data base management system on its 64-bit minisupercomputers, the company recently announced.

Software Alliance Corp. in Berkeley, Calif., has acquired **Bankmatic Systems** in Beaverton, Ore., a producer of software for medium-size and community banks using Data General Corp. minis.

Sterling Software, Inc. in San Bernardino, Calif., and **Tangram Systems Corp.** in Cary, N.C., said they will exchange technical expertise to build "a universal storage management system" between personal computers and mainframe storage devices. Tangram adds micro-to-mainframe cooperative processing know-how to Sterling's storage management expertise.

Citicorp Information Resources has purchased the Comprehensive Banking System from **The Newtrend Group, Inc.** in Orlando, Fla. The banking system is used on the IBM System/38.

Roscoe

CONTINUED FROM PAGE 21

the process would need to be repeated, be said.

"It's a very useful facility for me. Instead of scattered commands, you get unified commands," Murray added.

In addition to partitioned data sets, Roscoe can attach to the master files of ADR's change-control product, the Librarian; to IBM's disk drive indexes, known as the Volume Table of Contents; and to load modules of executable code, said Richard D. Specht, ADR's product manager.

The attached data set facility also allows a programmer to do a wild-card search for a data set that he can only partially name, Murray said.

In the past, programmers had to print out a copy of their program after it failed to compile to search for bugs. With the new release, a Roscoe user can attach to IBM's JES2 and examine the program after a compile attempt without printing it out. "You know it's not an executable module, so why print it out in the first place?" Murray asked.

Release 5.5 allows a site to specify caching for active work space blocks, with Roscoe maintaining the most recently accessed blocks in cache. ADR spokesmen said the move can cut in half the I/O needed for program editing.

Roscoe uses a new search algorithm for string character searches, which chooses a search technique based on the characteristics of the string, Specht said. The algorithm saves as much as 40% of the CPU cycles previously devoted to searches, he claimed.

Program function keys may be modified during sign-on to a Roscoe session so the commands that they execute apply to a specified type of data.

Previously, the progran function keys could not be tailored to a particular session and had to be applied to a general data set, Specht said.

The Roscoe Programming Facility command set has been extended to include commands that allow the user to review and import data sets, to simplify direct-access storage device management and to control Roscoe sessions, ADR spokesmen said.

The 17-year-old Roscoe has been a steady revenue producer for ADR and is regularly updated. Version 6 is expected out in early 1988 and will take the product in new directions, according to the firm.

Release 5.5 of Roscoe is priced at $60,400 and is available immediately.

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NEW PRODUCTS

Systems software

A software system for maintaining a library of IBM publications has been announced by **International Business Information Systems.**

LM/1 is said to provide a data base of more than 600 IBM 370-, 4300-, 3300-, 3080- and 3090-related publications. It can produce manual covers in multiple formats, control "IBM Technical Newsletter" distribution and maintenance and create borrower cards for establishing and maintaining a lending library.

The package also establishes a classification scheme for organizing manuals into a physical order and produces summaries by classification and volume.

Available for IBM DOS/VSE and MVS operating systems, an LM/1 license costs $500.

International Business Information Systems, P.O. Box 15780, 1926 Marengo St., New Orleans, La. 70175.

Applications packages

Evans Griffiths & Hart, Inc. has released **Version 4.1** of its **KDSS** key-to-disk data-entry software package for Digital Equipment Corp. VAX/VMS environments.

The native-mode Version 4.1 runs concurrently with other applications on the VAX, providing a multiterminal data entry system. It also runs as a stand-alone data entry system.

Facilities provided include entry, verification, examination and modification of batches of records and reformatting of that data on output to disk or tape.

A single-CPU license for KDSS Version 4.1 ranges from $7,500 to $10,500.

Evans Griffiths & Hart, 55 Waltham St., Lexington, Mass. 02173.

Languages

Philon, Inc. has ported its **Cobol, Basic** and **Fortran programming languages** to the Sun Microsystems, Inc. Sun 3 Workstation running under the University of California at Berkeley's Unix Version 4.2.

Fast/Cobol is an ANSI '74 compiler said to be compatible with Ryan-McFarland Corp.'s RM/Cobol. Fast/Basic-M is a true compiler said to be compatible with Microsoft Corp.'s Basic. Fast/Fortran is an ANSI '77 compiler designed for the development of scientific and engineering applications.

Fast/Cobol costs $2,200, Fast/Basic-M costs $600 and Fast/Fortran costs $1,200.

Philon, 641 Avenue of the Americas, New York, N.Y. 10011.

Utilities

Epilog 1000, a historical reporting facility that runs in an external address space, has been added to **Candle Corp.**'s CICS/MVS family of software products.

According to the vendor, Version 410 of the Epilog 1000 family extends external address-space operation to all of the products and includes support for IBM's DB2.

Epilog 1000 provides a method of collecting and reporting on CICS activity at the transaction level. It also has a tracking feature that enables users of IBM's CICS 1.7 to report on transactions that cross multiple regions, even on different machines.

The historical reporting facility costs from $6,000 to $13,500. The DOS version, scheduled to be available later this summer, costs $2,000.

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SMALL TALK

William Zachmann

Windows' growing pains

The most important aspect of IBM's April 2 announcement of the Personal System/2 line of personal computers and the OS/2 operating system was actually available in the fall of 1985. It was at the Comdex/Fall '85 show in Las Vegas in November of that year that the first production copies of Microsoft Corp.'s Windows 1.0 were distributed.

Long in coming, Windows represented an enormous investment on Microsoft's part, aimed at providing — on Intel Corp. 8086-based IBM and compatible personal computers — a graphical user interface of the type pioneered on the Xerox Corp. Star and popularized on Apple Computer, Inc.'s Macintosh.

Intended as a higher priced product, Windows 1.0 was aggressively priced at $99. Even so, Windows wasn't exactly an immediate smash. Performance on Intel 8088-based systems wasn't adequate.

Despite compromises like offering tiled rather than over-

Continued on page 29

Deskpro 386 plays mini's role

BY ALAN J. RYAN
CW STAFF

DENVER — Making more effective use of the processing power of personal computers more than intrigues Rich Gonzalez.

As manager of microcomputer systems at Great-West Life Assurance Co.'s U.S. headquarters here, Gonzalez runs a Compaq Computer Corp. Deskpro 386 computer under Santa Cruz Operation's (SCO) Xenix operating system with Informix Software, Inc.'s Informix as its data base. With the addition of enhanced I/O boards, Gonzalez says he has transformed the Deskpro into a minicomputer that supports other terminals.

Great-West uses its 386 system to build administrative support systems.

"I'm not trying to give the impression that the Deskpro 386 can replace the IBM 3090 or that [it] is powerful enough to replace every mini on the market, because it isn't," Gonzalez says. "But it is powerful enough to fit in a certain niche, and it can give you good performance."

Additionally, Gonzalez says, the price of setting up a microcomputer based on the Intel Corp. 80386 microprocessor is low enough so that users can afford to upgrade in the future.

"What you can look at with [the Compaq system] is distributed processing, where you can begin to take some of the load off your mainframe. It may not replace a mainframe computer, but it might postpone having to purchase an additional one or upgrade your existing one," Gonzalez says.

Originally, the manager says, he had looked at IBM Personal Computer XTs and ATs and considered the power of those units. "We tied them into our mainframe and made them act as terminals for policy inquiries and underwriting status," he explains.

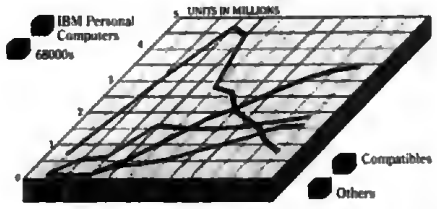
Next, Great-West purchased a copy of SCO's Xenix to run un-

Continued on page 29

Data View

U.S. PC shipments

Ten years from 1981



INFORMATION PROVIDED BY INTERNATIONAL DATA CORP.
CW CHART: AMY J. SWANSON

DEC micro maven asks, 'PS/who?'

In mid-1982, nine months after archrival IBM introduced its future standard-setting Personal Computer, Digital Equipment Corp. entered the microcomputer race with three incompatible systems: the Rainbow, the Professional and the Decmate. The most popular of the trio, the general-purpose Rainbow, was never compatible with the IBM PC. And although many observers say they believe the Rainbow was better engineered than the IBM PC, IBM's entry outsold the Rainbow by a huge margin.

In September 1986, DEC announced the successor to the Rainbow: the Vaxmate, an IBM

DEC's John Rose

PC AT-compatible system with built-in Ethernet networking capability.

John Rose, manager of DEC's Personal Computing Systems Group, recently spoke with *Computerworld* senior writer David Bright about the minicomputer giant's PC strategy.

What is DEC's personal computer strategy right now?

Our strategy is to be the best integrator of [Microsoft Corp.] MS-DOS machines to corporatewide or enterprisewide networks.

How will the IBM Personal System/2 affect the Vaxmate and DEC's micro plans?

I read one of the industry reports recently that said there are 20 million MS-DOS PCs out there today. There's a standard that's already been set. Now, IBM has changed the standard with the introduction of the Micro Channel and, yet to be seen, their extensions to OS/2. So, like everyone else, we're going to wait and

Continued on page 32

Inside

- Intel positions its first 386-based system as net server. Page 28.
- Allstate to use Innovative Software's Smart system for workstations. Page 28.
- Zenith adds RAM to XT compatibles. Page 36.

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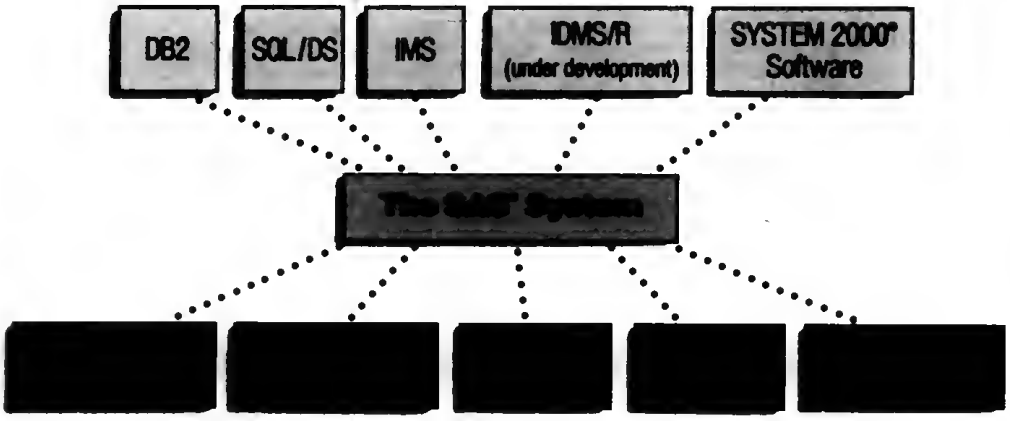

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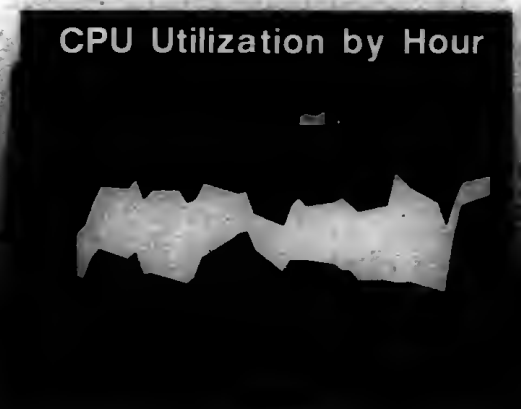

Intel unwraps 386-based network server

Financially geared system works with Irmx to link mainframes, minis, micros

BY ED SCANNELL
CW STAFF

HILLSBORO, Ore. — Intel Corp.'s Systems Group recently introduced its first 80386-based system that Intel said it will position as a network server to be connected to mainframes, minicomputers and financial workstations.

Dubbed the Intel System 320, the system was designed to work with Irmx, Intel's real-time, multitasking operating system that has resources such as interrupt management and standard device drivers. The target markets for the System 320 include major investment banks, brokerage firms and stock exchanges, according to Joe Huseonica, general manager of Intel's integrated systems operation.

"A typical stock exchange application is a System 320 serving as a link between the mainframe via a CCITT X.25 or IBM Systems Network Architecture connection and local-area networks made up of video terminals and trader workstations," Huseonica said.

The system will reduce the need for a more expensive cable link from the mainframe to workstations, terminals and microcomputers, a company spokesman said. It offers similar connectivity for distribution needs of investment banks and brokerage firms.

THE TARGET markets for the System 320 include major investment banks, brokerage firms and stock exchanges.

The Intel System 320 is compatible with the company's Multiserver software, which connects microcomputers, terminals, minicomputers, mainframes and applications into a department-level system.

The system provides file, print, communication, network application, administration and compute services.

Users can custom-order the System 320 in a variety of configurations.

Besides Irmx and Multiserver, other options include languages and tools, storage devices and Intel's Opennet.

In volume, the Multiserver System 320 costs $15,520. The Financial System 320 has a volume price of $12,950.

Allstate plans workstation

BY DOUGLAS BARNEY
CW STAFF

LENEXA, Kan. — Allstate Insurance Co. recently announced plans to design a managerial workstation using the Smart Software System, an integrated software package from Innovative Software, Inc. based here.

The Allstate system, initially slated for use on 1,000 new personal computers, is a custom application serving Allstate market sales managers in the firm's domestic operations.

Allstate declined to provide details of the system and refused interviews on the subject.

Basically a site license

The contract, which is essentially a site-license agreement, allows Allstate to make up to 1,000 copies of the Smart Software System.

The license could be renegotiated to allow copies for all 15,000 Allstate agents, according to Innovative Software President Michael Brown.

According to Brown, Allstate chose the system largely because of its structured programming language, which allows developers to customize the system and allows the various modules to work together.

System speaks English

"It is a structured, procedural command language, which is English-oriented to allow people not formally trained in programming to develop rather sophisticated applications. The same applications language allows a user to call virtually every feature and function within the Smart Software System," Brown said.

Allstate is expected to use all Smart Software System modules, including spreadsheet, data base, word processing, graphics and communications.

Allstate's custom application took some three months to write and is now completed. Brown said he expects the application to be installed during the next six months.

The version of the Smart Software System to be used by Allstate runs under Microsoft Corp.'s MS-DOS and is able to run on local-area networks. Brown said he is unsure whether Allstate will be using the system in a networked environment.

How to keep up with

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Deskpro 386

CONTINUED FROM PAGE 25

der the AT, "just to see what type of performance we could get out of the machine," Gonzalez says. "We identified, at that time, that we could run one or two terminals with the AT for some light applications."

When Compaq announced the Deskpro 386, Great-West bought the unit. "We tried our copy of Xenix on the 386 and put a couple of terminals on it, and we knew that we could easily add five or six terminals on this computer," Gonzalez says.

Rather than tying up all of the unit's serial ports on terminals, Gonzalez obtained an Intelliport AT-8 I/O board from Intellicom Corp. in Roswell, Ga., that attaches to one of the 16-bit slots in the Compaq computer. The board has a cable that attaches to an external box that has eight RS-232 ports. "So by using one slot, you have eight ports," he says. The board has dual-ported memory and a processing chip built into it.

The Deskpro 386 running SCO's Xenix acts as the console and allows the unit to run multiple sessions, he says. Terminals, including the company's XT and AT computers emulating Digital Equipment Corp. VT100s, are tied into the console, as are Wyse Technology 60 terminals. With the I/O card, two or three sessions are allowed per terminal, he says. The multiple sessions aid programming or development, Gonzalez adds.

"We put an external tape drive on the machine because we want it to be able to handle larger size tapes," Gonzalez says. "We designed a system for backup where we maintain multiple levels of backup — some permanent, some recyclable tapes — and we have a combination of off-site storage where the data is protected."

Currently, Great-West is using the Deskpro 386 running 16-bit code. "We're basically running it as if it were a fast 286 chip," he says. However, SCO and Informix have planned 386 support. "We're hoping for a doubling of performance" with the 386 support, Gonzalez explains. "We should be running 32-bit code in some of our systems by September. I imagine we'll be running full 32-bit code when we get the operating system."

Windows

CONTINUED FROM PAGE 25

lapping windows, Windows 1.0 simply required more power than most of the installed base of systems in late 1985 had.

IBM Personal Computer AT and compatible systems using the faster Intel 80286 microprocessor offered somewhat better performance. But there weren't all that many in use in late 1985, and the 6-MHz systems of the day still didn't have the "oomph" to do a decent job with Windows.

Also, very few systems had graphics adapters and monitors capable of adequately supporting Windows. Monochrome windows were hardly worth the bother. Then, too, not many users had printers that could be effectively used with Windows.

On top of all that, there was hardly any software to take advantage of Windows. Writing applications that make use of the Windows interface is quite different from writing for character-based environments.

Better technology

A lot has changed since late 1985, however. Faster systems based on 10- and 12-MHz versions of 80286 microprocessors — and even faster systems based on 80386 chips — are widely available. Lower cost laser printers and high-quality, 24-pin dot matrix printers make high resolution accessible to a growing number of users.

The widespread adoption of IBM's Enhanced Graphics Adapter (EGA) and compatible adapters and monitors provides a base of systems that can at least support the 640- by 350-pixel, 16-color EGA resolution.

Multiscan monitors like the NEC Corp. Multisynch and a growing number of others, combined with newer adapters like the Video-7, Inc. Vega Deluxe or the Hercules Computer Technologies, Inc. In Color Card, provide even higher resolutions.

Windows improvements

Microsoft, since late 1985, has done its own part by considerably improving the performance of Windows 1.0.

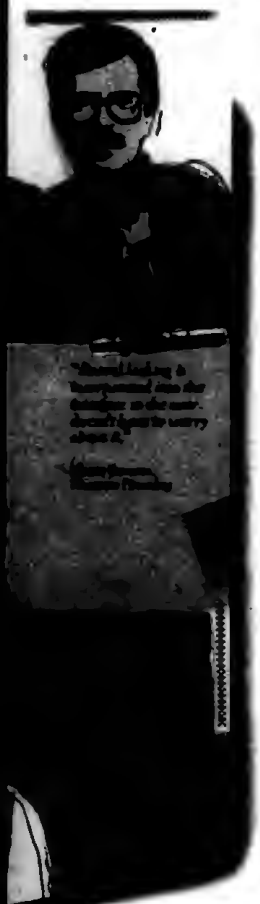
Finally, first-rate software that was designed to run using Windows is gaining considerable momentum. Micrografx, Inc., one of the pioneers in Windows applications, has added Windows Draw and Windows Chart to its initial, and very good, In-a-Vision computer-aided design package.

The most important boost to Windows, however, came with IBM's PS/2 and OS/2 announcements this spring. Not only is Windows included as an integral part of OS/2 as the Presentation Manager in the OS/2 Standard Edition Version 1.1, but also, by making the Presentation Manager a part of the Systems Application Architecture specification, IBM has effectively adopted Windows as a key part of its future standard user interface.

Next week, I'll examine the relationship between Microsoft Windows and the IBM OS/2 Presentation Manager in detail. I'll also look at the transitional role to be played by Windows Version 2.0, which will be available this fall.

Zachmann is vice-president of research at International Data Corp.

concurrent events



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Same time, same network

The multiuser capabilities of Paradox work like an airline reservation system, where people share and update information constantly. Without getting in one another's way. This transparent, concurrent data sharing lets users do things that are impossible in other PC databases.

For example, other databases often lock entire files, or else lock records in a way that makes the data below inaccessible.

Paradox 2.0, on the other hand, lets users edit, browse, query, sort and create reports in the same file at the same time. Records lock automatically, telling others the user's name, and leaving data below accessible. When revisions are made, the changes appear on all screens in real time. Or at a set interval. With all these features, Paradox helps more people get more done.

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Eyewitness report

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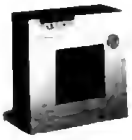

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ortant than computers.

DEC

CONTINUED FROM PAGE 25

see. From the standpoint of integration, as PS/2 systems become prevalent, we'll look st integrating them.

The Vaxmate and the Network Integration Package, which enables IBM PCs to function like Vaxmates, were introduced last September, but it wasn't until June that all the pieces of the puzzle were shipping. Why the delay?
There were s couple of things that contributed to the delay. One is the overall complexity. You're dealing with s network that involves not only the Vaxmate as s network PC, but we also took the task of integrating the full family of IBM PCs. That's developing hardware, part of which is the integration kit, and both client- and server-level software. That's s very complex task. Everything is doing quite well today, but it took some additional time to assure the performance and functionality of that network.

What went wrong with the optional Vaxmate expansion box that contains the hard disk drive?
We made s couple of design changes there. We changed s rev [drive] of s component, and that was basically the net of the problem.

There's some subtle changes between that drive and the previous drive. We've been shipping the expansion box in volume since February, and we didn't have any problems reported in the field with the seed units that we sent out prior to first customer ships or any of the customer ships.

It has been said that some overheating occurred because the expansion box had no fan. Has a fan been added to the design?
We fixed the problem without s fan. The volume shipments that we made in February, and through today, still do not have the fan. It's not necessary.

How many Vaxmates has DEC sold so far?
We won't quote those numbers.

Some analysts say Vaxmate sales have been sluggish. Have sales met expectations so far?
The sales have been coming right in line with our strategy and plans. On the integration side, the servers and server software have just been outstanding.

Who is the IBM Personal Computer Network Integration Package targeted for?
It's targeted for customers who have invested in IBM PCs, XTs and ATs, to make them full peers within the network so that they can protect that investment they've already made. For open desks which do not have s PC on them, we're selling the Vaxmate as the ideally designed network device for MS-DOS.

Many other AT-compatible systems are sold for a fraction of the Vaxmate's $4,065 base price, which doesn't include the hard disk drive. How have customers reacted to the price so far?
There's a bit of s mixed reaction. We're certainly selling a lot, and they're selling well. We certainly get some customer pushback on the price, but part of it is getting the customer to understand all the inherent features that are in the Vaxmate, as opposed to an inexpensive clone. There's s lot of features that you would have to go and build up and add onto s clone to make it s comparable device.

Last month, DEC brought out a Vaxstation 2000 workstation that was priced at $4,600. Will the Vaxstation systems compete against the Vaxmate at all?
No, because they're aimed st different markets. The Vaxstation is aimed st the workstation marketplace. It's there to compete with Sun Microsystems, Inc. and Apollo Computer, Inc. and the others. It's there for either s Unix or VMS type of user, while the Vaxmate is definitely aimed st the MS-DOS market.

Is there a possibility that the Vaxstations could, at some point, access MS-DOS on servers?
That's within the realm of possibility.

But they still wouldn't compete against the Vaxmate?
No.

Do you forsee any price cuts on the Vaxmate in the near future?
That's something I won't discuss at this point in time.

Are you planning to introduce an Intel Corp. 80386 version of the Vaxmate?
We won't talk sbout that either.

Are any of DEC's original three micros still being made and sold?
Yes. In the case of the Decmate line, we introduced s new model last December — the Decmate III Plus. Decmates are selling very well and continue to [sell well]. We're still selling Pros. In the case of the Rainbow, we announced that we are finishing up manufacturing [st] the end of this year. We will still provide software, support and everything else for all of our Rainbow customers. The Rainbow still has a lot of utility in the marketplace. With the introduction of the Vaxmate, our customers understood that that was an evolution process.

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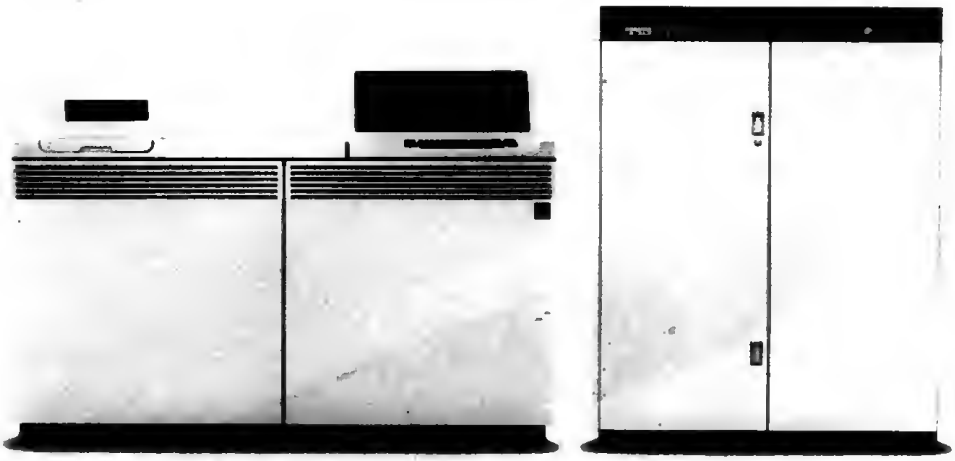

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NEW PRODUCTS

Systems

Zenith Data Systems has increased the random-access memory (RAM) and reduced the prices of its **Z-159** line of IBM Personal Computer XT-compatible microcomputers.

The Z-159 now offers 512K bytes of RAM. The Model 1, featuring a 5¼-in. floppy disk drive and Hercules Computer Technology, Inc.-compatible color graphics adapter (CGA) card, costs $1,449.

The Model 2, featuring two 5¼-in. floppy disk drives and a Hercules-compatible CGA card, costs $1,899.

The Model 3 features a 20M-byte hard disk drive, 5¼-in. floppy disk drive, Hercules-compatible CGA card and Microsoft Corp. Windows. It is priced at $2,199.

The Model 12, featuring an IBM Enhanced Graphics Adapter card and two 5¼-in. floppy disk drives, costs $1,899.

Zenith Data Systems, 1000 Milwaukee Ave., Glenview, Ill. 60025.

Software applications packages

A line of banking data bases on compact optical disks that is said to allow users to analyze, manipulate and use information contained in more than 14,000 bank-call reports has been announced by **Sheshunoff & Co.** and **Datext, Inc.**

The Commercial Banks data base combines banking information from Sheshunoff with Datext's menu-driven software and compact optical disks. It features more than 300 variables for screening call-report data to allow creation of report formats. The data base contains analyses, rankings and ratings of federally insured U.S. commercial banks for the past six years, the vendors said.

The Commercial Banks requires an IBM Personal Computer or compatible. It costs $9,500 per year.

Sheshunoff, 505 Barton Springs Road, Austin, Texas, 78704. Datext, 444 Washington St., Woburn, Mass. 01801.

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Software utilities

Seemore, a screen manager for Lotus Development Corp.'a 1-2-3 said to give users a choice of compressed formats that double, triple or quadruple the number of cells displayed on the screen, has been introduced by **Personics Corp.**

Seemore offers three reduced character sizes along with the usual 1-2-3 character size, and the vendor said users can zoom in and out as needed. Seemore is also said to provide user-selectable background and foreground colors, normal or reverse video and several screen-layout options. It can produce hard-copy printouts of any compressed screen, the vendor said.

Seemore works with Lotus'a 1-2-3 Release 2.0 or later on IBM Personal Computers or compatibles with a standard IBM Color Graphics Adapter, Enhanced Graphics Adapter, Video Graphics Adapter or Hercules Computer Technology, Inc. graphics adapter. Seemore is priced at $79.95.

Personics, 2352 Main St., Concord, Mass. 01742.

Software enhancements

Version 2.0 of **DBfind**, a programming tool for Ashton-Tate'a Dbase programmers, has been announced by **Software Development Factory.**

DBfind is said to find real syntax errors in Dbase programs. It also generates a single- and cross-module cross reference of variables, including the type of each reference. It runs inside of Dbase and checks the number of arguments to built-in Dbase functions.

DBfind is priced at $99.

Software Development Factory, P.O. Box 1106, Hunt Valley, Md. 21030.

Data storage

Priam Corp.'s Systems Division has reduced the prices of its 40M-, 60M-, 75M-, 100M- and 230M-byte **Innerspace ID Series** family of internal disk add-in kits as well as its **Storagespace ED Series** family of desktop external add-on storage systems.

The IBM Personal Computer AT-compatible storage systems are now priced as follows: The ID40, $1,150; the ED40, $1,450; the ID60, $1,350; the ED60, $1,650; the ID75, $1,550; the ED75, $1,850; the ID100, $1,750; the ED100, $2,050; the ID230, $3,720; and the ED230, $4,020.

Priam, 20 W. Montague Expwy., San Jose, Calif. 95134.

Board-level devices

Nth Graphics Ltd. has reduced the price of its **Nth Engine** color-display controller for personal computer/computer-aided design applications.

The 640- by 480-pixel resolution Nth Engine is said to be capable of driving multisynchronous-type monitors with up to 16 colors out of a palette of 4,096. It performs zooms in about two seconds on large drawings, the vendor said.

The Nth Engine is compatible with Versacad Corp.'a Versacad and Autodesk, Inc.'s Autocad.

The Nth Engine is priced at $2,495.

Nth Graphics, 1807-C W. Braker Lane, Austin, Texas 78758.

NETWORKING

DATA STREAM

Mark LaRow

T1 emphasis shifts to data

Now that many large and medium-size organizations — ranging from banking and transportation to the federal government — have designed and built backbone T1 networks, where can they expect technology to take them next? To understand where T1 processors are going, it is necessary to understand how they have developed to where they are today.

T1 networking was originally developed to provide cost-effective dedicated trunk connections between telephone company switches. It was never thought necessary that T1 systems should perform dynamic, user-initiated switching, since that was the domain of the central-office switches. It was natural, therefore, that the first sophisticated T1 processors would provide dedicated channel connections, on a static basis, between network ports. In fact, the only real difference betweeo the first generation of T1 network processors and the original D channel banks was that the T1 processors grew out of the

Continued on page 39

Users group airs ONA wish list

Lobbies FCC, Bells for uniformity, equal access, cost-based pricing

BY MITCH BETTS
CW STAFF

WASHINGTON, D.C.— A major users group, hoping to influence the makeup of the regional Bell holding companies' Open Network Architecture (ONA) plans, recently issued a white paper that describes in detail what business users want from ONA.

The user proposal calls for national uniformity in the ONA plans, cost-based pricing and nondiscriminatory user access to the unbundled network functions provided by ONA.

Under the Third Computer Inquiry rules that created ONA, the Federal Communications Commission required the Bell companies to offer enhanced-service providers and users the ability to obtain equal access to unbundled basic elements of the local network. The Bell companies have until February 1988 to submit their ONA plans to the FCC.

In essence, ONA would unbundle the network services now provided by tariff and allow users to pick and choose those basic service elements with which they want to build their networks.

The users' ONA proposal was drafted by the Coalition of Open Network Architecture Parties (CONAP), which includes members of the Ad Hoc Telecommunications Users Committee; Boeing Computer Services Co.; CBS, Inc.; Compuserve, Inc.; Graphic Scanning; and Trintex, a videotex joint venture of IBM and Sears, Roebuck and Co.

CONAP submitted the proposal to the FCC and to each of the seven regional Bell holding companies for comment and consideration.

With only seven months left before carriers file their ONA plans, the user coalition decided

Continued on page 38

Bells' packet-switch plans misfire

BY ELISABETH HORWITT
CW STAFF

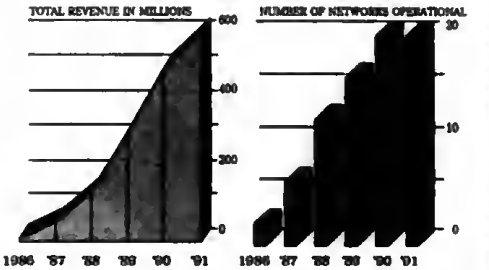
Plagued by recalcitrant regulatory bodies and tepid market response, the regional Bell holding companies are taking longer than they expected to launch successful packet-switching operations, according to a report published recently by Link Resources Corp.

Currently, only 10 to 15 local access and transport areas (LATA) have full-service packet-switching services, said Link, a New York-based market research subsidiary of International Data Corp. Local packet networks in these areas provide asynchronous-to-CCITT X.25

Continued on page 38

Local packet-switching networks taking off slowly

Customers wait for networks to be available in more areas; local carriers need more demand to cost-justify service



INFORMATION PROVIDED BY LINK RESOURCES CORP
CW CHART

Concord cuts MAP server fees

BY ROSEMARY HAMILTON
CW STAFF

MARLBORO, Mass. — Concord Communications, Inc. recently chopped prices by 30% to 40% on its terminal servers for Manufacturing Automation Protocol (MAP) networks.

"There's been lots of pressure on MAP suppliers to lower their costs," said Anthony Friscia, president of Advanced Manufacturing Research, Inc., a consulting firm in Salem, Mass. "One of the biggest criticisms in the whole Digital Equipment Corp. MAP controversy has been that Ethernet boards are significantly less expensive than MAP connections."

Concord's Token/Net Interface Module can connect up to 12 terminals or RS-232 devices as well as factory-floor devices, such as numerical controllers, over a broadband or carrierband network.

With the price cuts, Concord will be offering per-connection prices of less than $500. The 12-

Continued on page 39

Inside

- **DSC Nestar workstations boast 640K-byte memory, MS-DOS, AT-style keyboard. Page 41.**
- **Crosscomm uncrates Ethernet LAN bridge. Page 41.**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Packet switches

CONTINUED FROM PAGE 37

conversion, but not all offer inter-LATA exchange services. Link estimated that it will take two to three more years for local packet switching to be available in all major metropolitan areas of the U.S.

Long and winding road

A Bell operating company's route to X.25 service offerings involves several stages. It must file with the Federal Communications Commission for approval to offer packet-network services and then obtain waivers in order to offer asynchronous-to-X.25 conversion services and inter-LATA interconnection. Finally, the state public utility commission must give the go-ahead.

While stating that the operating companies have not offered X.25 services long enough to judge their impact on the market, the Link report predicted that demand for local packet networks during the next five years will stem primarily from interexchange carriers such as AT&T and MCI Communications Corp. and value-added network vendors such as Telenet Communications Corp.

Long-distance carriers that offer X.25 services of their own will use the Bell operating companies' packet-switching facilities to extend their own presences in different regions and to provide users with the cost-efficiencies and error-checking features of packet awitching over the local loop. In turn, interexchange carriers will provide the operating companies with a way to serve national corporations whose sites extend across many LATAs.

The operating companies have been slow to form such alliances with interexchange carriers, Link reported. Interconnection between local and long-distance X.25 services has been hampered by the lack of uniformity in pricing schedules, billing procedures, network management and user-access protocols among the operating companies' local X.25 networks

Inconclusive

The regional and interexchange carriers have met since 1985 to discuss possible standards for X.25 network management, but no conclusions have been reached so far, Link stated.

The operating companies and value-added network vendors also have failed to reach a consensus on billing issues such as how to collect and apportion incoming revenue, who will collect billing information and how it will be exchanged between the local and interexchange carriers.

A national network of fully interconnected local packet networks, involving both Bell operating companies and value-added networks, will be phased in during the next five years, Link predicted.

Through 1990, the operating companies will sell their local packet-networking services to consumers primarily through data base services, interexchange carriers and other intermediaries, the report stated. By then, consumers will begin recognizing the advantages of packet-switching services over traditional leased-line connections.

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ONA

CONTINUED FROM PAGE 37

it was necessary to stimulate discussion of users' needs before it was too late, according to CONAP's attorney, James S. Blaszak, of Heron, Burchette, Ruckert & Rothwell.

"The basic goal of any ONA plan should be to assure widespread availability of network functions that are, or should be, integral to the national common-carrier telecommunications infrastructure," the coalition said, stressing that the Bell companies should have no better access to the network functions than any other party.

"In this regard, CONAP endorses the central goal of the FCC's program, notwithstanding our serious concerns regarding the practicalities of its eventual implementation," the document said.

CONAP's proposal outlined the following basic principles that should underlie any ONA plan:

- Technical interconnection, interface and transport arrangements, as well as basic service elements, should be uniform across all local-exchange carriers.
- Access to network functions by the Bell companies, enhanced-service providers, end users and others should be neutral.
- Bell companies should offer a network-service element when there is demonstrated demand or reasonable expectation that demand will develop.
- All requests for ONA availability should be satisfied, unless the Bell company demonstrates it is too expensive or impractical at a particular central office.
- The establishment of unbundled-service elements should not affect the price or availability of bundled tariff services to end users.
- All basic-service elements should be regarded as regulated offerings, with rates based on costs.
- The natural advantage that Bell companies have in obtaining basic-service elements needed to offer enhanced services should be minimized. The Bell companies should provide others with co-location in the central office or establish "virtual co-location zones" nearby.

CONAP also provided a list of basic-service elements that businesses would find useful in their networks. They included basic subscriber access and network signaling, basic interoffice transport and call screening.

T1

FROM PAGE 37

data world and, thus, were capable of supporting a greater variety of data rates — 300 to 1.5M bit/sec. rather than only 56K bit/sec., as with D channel banks.

The second generation of T1 processors was patterned after the tandem routing capabilities of switching statistical multiplexer networks, which was a significant advancement from the simple point-to-point or drop-and-insert routing of the first generation.

The next logical step in T1 processor development would have been to provide true statistical multiplexing in which bandwidth for both voice and data would be provided in a statistical fashion rather than in dedicated blocks. Vendors partially accomplished this goal in the current generation of T1 processors through two features variously known as "contention bandwidth" and "speech interpolation."

Contention bandwidth technology allocates the user-dedicated bandwidth only when the data or voice device requests it. Speech interpolation brings T1 processors much closer to true statistical multiplexing in that a large number of voice conversations can be statistically multiplexed with one another by taking advantage of the natural pauses in speech.

What's in store

The next logical development for T1 processors will be support of the addressing capability and true statistical nature of current packet-switching networks. In current T1 networks, end-to-end channel connections — both permanent channels and contention channels — must be defined and established by a network operator rather than by the end user. In the same way that packet switching has been replacing dedicated circuit networks, user-addressable T1 networks will replace the current generation of dedicated bandwidth processors.

Telecommunications industry watchers can expect to see a clash between the diverse technologies that represent today's private branch exchange (PBX) systems, T1 processors and packet switches for the role of the backbone network processor. Will T1 processors replace packet switches and voice switches? Will the PBX vendors develop sophisticated data handling capabilities and T1 interfaces in their products? Will packet-switching network vendors develop T1 interfaces and fast voice packet switching for their products?

I believe that we will begin seeing strategic alliances formed between companies in these diverse technologies, since no one vendor has the expertise in all of the required areas. I believe that whichever type of system becomes the best positioned to migrate users from their current private T1 networks to an Integrated Services Digital Network (ISDN) environment will become users' primary backbone network processor.

Migration to ISDN will involve the ability to allocate bandwidth dynamically and intelligently over both private T1 facilities and the range of ISDN services to which the processor is connected.

LaRow is group manager of the Wide Area Telecommunications Group at Network Strategies, Inc., a Fairfax, Va.-based consulting firm.

Concord

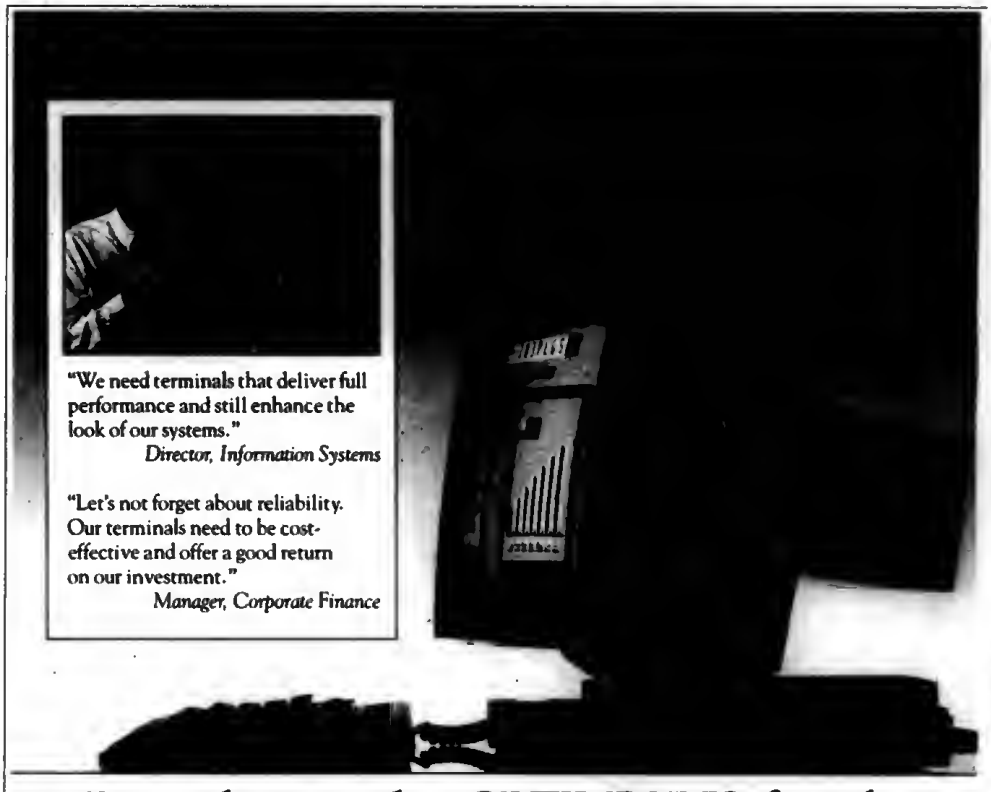
FROM PAGE 37

port module, which had been selling for $6,630, now sells for $5,250, the vendor said.

The eight- and four-port versions will cost the user more per connection. The eight-port module was cut to $3,950 from $5,635, and the four-port module, which was priced at $4,080, now costs $2,550.

"This is in response to market pressures," said Robert Nerz, manager of product marketing. "We haven't had a price cut in two years."

The Token/Net Interface Module allows users to set up point-to-point, multipoint and broadcast connections.



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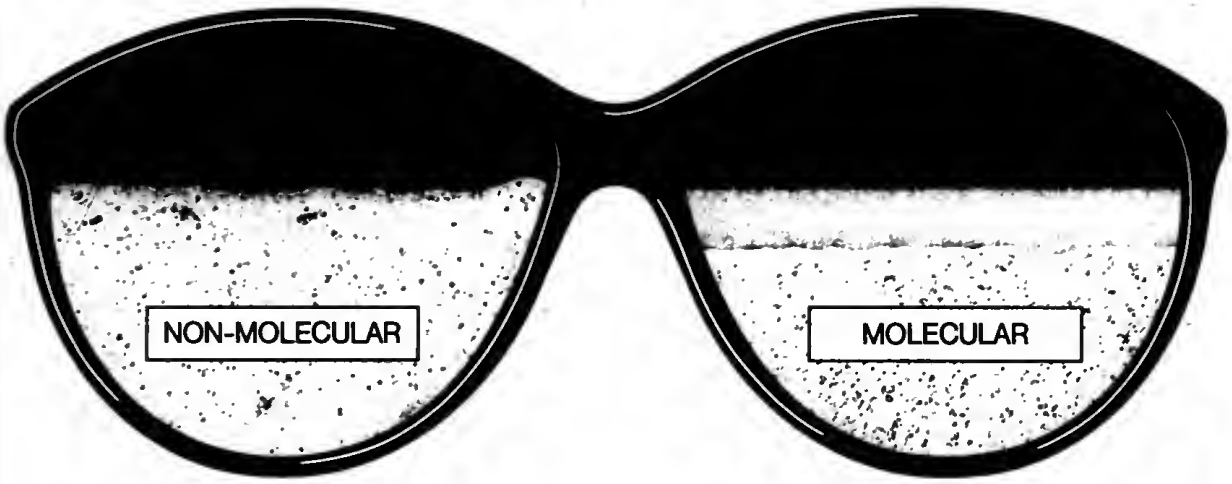

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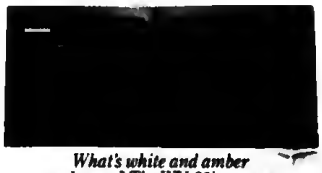

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NEW PRODUCTS

Local-area network hardware

DSC Nestar has introduced personal computer workstation configurations featuring either an Ungermann-Bass, Inc. Arcnet or IBM Token-Ring adapter card.

The **DSC Nestar PC/AT-286** and **PC-8088-II** workstations include 640K bytes of memory, Microsoft Corp. MS-DOS, an IBM-style Personal Computer AT keyboard, provision for a math coprocessor, Arcnet network adapter cards, color or monochrome graphics adapter boards, an optional PC local-area network program and optional 14-in. IBM Enhanced Graphics Adapter monitors.

A five-slot model of the vendor's PC/AT-286 Workstation costs $1,795. The eight-slot chassis costs $1,895, and the 12-slot system costs $1,945.

A five-slot model of the PC-8088-II Workstation is priced at $995. The eight-slot version costs $1,095, and the 12-slot system costs $1,145.

DSC Nestar, 1345 Shorebird Way, Mountain View, Calif. 94043.

Local-area network software

Version 2.40 of the **Lifenet** local-area network operating system for IBM Personal Computers and compatibles has been announced by **Univation, Inc.**

Lifenet combines standard file-server software with a built-in data base server that processes index files at the network server instead of at the workstation. Other features include the use of cartridge tapes for fault-tolerant processing.

Security functions include the ability to define a specific format for system passwords.

Lifenet is priced at $1,495.

Univation, 1231 California Circle, Milpitas, Calif. 95035.

Customer-premise equipment

Two facsimile products — a portable unit and an internal card — for IBM Personal Computers have been announced by **Asher Technologies, Inc.**

The **JT Fax** products were designed to send or receive Group III facsimile transmissions. Both accept ASCII text or scanner input. Documents may be sent from the computer screen or from stored files.

Graphics formats are supported, so data can be sent to a JT Fax and output to printers like the Hewlett-Packard Co. Laserjet Plus.

The portable model attaches to the serial port on a PC via an RS-232 cable. The internal card fits in a half-height slot.

The internal JT Fax model costs $395. The portable unit costs $495.

Asher Technologies, 1009 Mansell Road, Roswell, Ga. 30090.

Links

Linkware Corp. has announced the **Linkware Mac Connection**, said to work with host-based Linkware software to provide Apple Computer, Inc. Macintosh XL, 512, 512E, Macintosh Plus and Macintosh SE users with direct access to mainframe and minicomputer files.

Mac Connection allows communication between a Macintosh and a host, between two Macintoshes and between a Macintosh and an IBM Personal Computer. Information can reportedly be transferred in Macintosh, binary or text format.

Linkware host-based software consists of application development tools, file transformation, communications and file management.

The Linkware Mac Connection is priced at $300 in single quantities.

Linkware, 128 Technology Center, Waltham, Mass. 02154.

A learning bridge device used to interconnect Ethernet local-area networks (LAN) has been announced by **Crosscomm Corp.**

The **487EE** Ethernet-to-Ethernet LAN bridge is said to be capable of passing up to 9,000 packet/sec. in either direction. It uses an Intel Corp. 80186 processor for implementing the bridge algorithms as well as serving as a host for Ethernet adapter cards. The bridge also provides the appropriate interfaces for network management.

The 487EE interconnects either thin or thick Ethernet LANs. It costs $5,400.

Crosscomm, P.O. Box 403, West Boylston, Mass. 01583.

Protocol converters

A controller card introduced by **Micom Systems, Inc.**'s Interlan division is said to allow both Microsoft Corp.'s MS-DOS and AT&T Unix System V-based IBM Personal Computers to communicate over Ethernet using a variety of networking software.

The half-card sized **NI5210** can be used in network file servers running Novell, Inc.'a Advanced Netware, Banyan Systems, Inc.'a Virtual Network System, Locus Computing Corp.'s PC-Interface, Lachman Associates, Inc.'a System V Streams TCP, Datability Software Systems, Inc.'a Remote Access Facility, Fel Computing's Mobius and Sun Microsystems, Inc.'a PC Network File System.

The NI5210-8 with 8K bytes of random-access memory (RAM) costs $395; the NI5210-16 with 16K bytes of RAM costs $425.

Micom, 155 Swanson Road, Boxboro, Mass. 01719

File servers

The **Remote Screen Processor**, said to reduce response times on IBM 3270 Systems Network Architecture and Synchronous Data Link Control communication lines by providing a screen image storage and retrieval capability, has been announced by **The Protocol Team, Inc.**

The IBM Personal Computer-hosted Remote Screen Processor allows an IMS or CICS installation to download and store static screen data. From that point on, only the dynamic part of a screen is sent, along with a retrieve directive.

The product is inserted in the communication line between the host computer and co-located controller. It can be configured to serve up to three controllers.

The Remote Screen Processor costs $1,500.

The Protocol Team, Suite 107, 4020 Birch St., Newport Beach, Calif. 92660.

Modems/Multiplexers

The **Omnimux 2100, 2200** and **2300** multiplexers for fiber-optic or coaxial cable installation have been introduced by **Racal-Milgo**.

The multiplexers support eight, 16 and 32 IBM, Type A and compatible devices, respectively. They transmit data at

Racal-Milgo's *multiplexers*

2.3587M bit/sec. between multiplexers and have a common addressing that allows point-to-point or multidrop configuration.

Prices start at $995 for the Omnimux 2100 and $2,380 for the Omnimux 2300.

Racal-Milgo, 1601 N. Harrison Pkwy., Sunrise, Fla. 33323.

Diagnostic equipment

A fiber-optic cable fault locator said to use a laser to inject visible light into the cable has been introduced by **Fotec, Inc.**

The **Model S650** is a portable unit for tracing cables and finding cable breaks, areas of microbending loss and bad connectors.

It has an internal rechargeable battery that can power the laser for up to five hours of continuous operation.

The S650 is priced at $3,095.

Fotec, The Schrafft Center, Box 246, 529 Main St., Boston, Mass. 02129.

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SYSTEMS & PERIPHERALS

HARD TALK

Stanley Gibson

DEC snores, IBM scores

You hear it more and more. What began as a whisper a few months ago is turning into a full-blown roar.

Digital Equipment Corp.'s success is going to its head. The Maynard, Mass., minicomputer marvel is starting to believe its own press clippings. The result is that the fair-haired boy of the industry is getting spoiled by success and beginning to treat the computer community — much of which has been squarely in its corner — with disdain. Some had come to expect such hauteur only from its archrival, IBM.

To hear industry analysts describe two recent meetings held by DEC and IBM, the role reversal becomes shockingly clear. By all accounts, DEC bored the daylights out of the major mid-range analysts when it hosted a recent session in Glen Cove, N.Y.

"DEC did nothing but talk about IBM. They had nothing new," lamented a number of attendees. One consultant reported that DEC used figures of IBM processor performance taken from newspapers, rather than numbers it had arrived at through its own testing. Nothing exasperates consultants more than to be given a hollow sales pitch with no data to back it up. And if you can't tell them

Continued on page 47

Encore system draws applause

User hails performance, reliability of second-generation Multimax 320

BY JAMES CONNOLLY
CW STAFF

BOSTON — An early buyer of Encore Computer Corp.'s second-generation Multimax 320 is using the system to stay ahead of user demands for processing power, but he says he will not see a true test until a "thundering herd" of users arrives in September.

One of the first installations of the Multimax 320 was at Boston University's Academic Computing Center, where a 7-month-old Multimax 120 was upgraded with higher performance CPUs in June. Encore, a Marlboro, Mass.-based superminicomputer company founded by former Digital Equipment Corp. and Prime Computer, Inc. executives, announced the Multimax 120 in 1986 and the Multimax 320 in January.

"We got the upgrade at the beginning of the summer, and right now we are ahead of the students who are here for the summer. But I want to see how the performance is when the rest of the students — what we call the thundering herd — come back in the fall," reports Barry Z. Shein, manager of special projects and distributed systems at the Academic Computing Center. But while most students are away for the summer, the computing center remains active.

The center also runs DEC and Celerity Computing minicomputers and an IBM 3090 Model 200 mainframe as hosts and a variety of workstations, such as Sun Microsystems, Inc. and Apple Computer, Inc. Macintosh systems. The center primarily supports undergraduate computer science students at the 28,000-student university.

The Multimax 320 is one of four Encore systems on the university's campus. Three Multimax 120s are used by the university's College of Engineering for very large-scale integration (VLSI) design and other research.

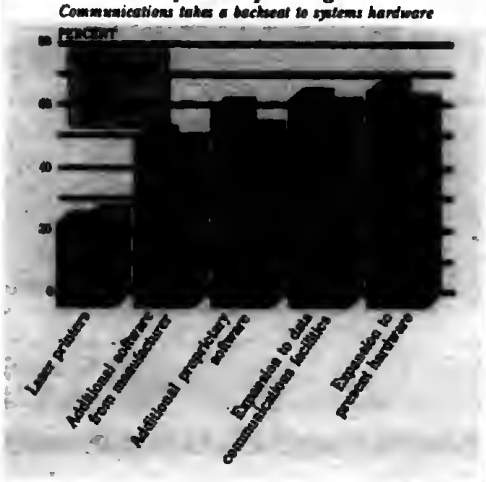
Shein chose Encore as a high-performance Unix vendor after seeing the first engineering Multimax. "It worked. It was up a lot. I liked the idea of incremen-

Continued on page 46

Data View

Acquisition planning

Communications takes a backseat to systems hardware



INFORMATION PROVIDED BY DATAPRO RESEARCH CORP
CW CHART

Prime lands Pan Am role

BY JAMES CONNOLLY
CW STAFF

INDIANAPOLIS — Prime Computer, Inc. systems will be playing a role next week when the 10th Pan American Games open here.

Prime has been designated an official sponsor for the Olympic-like quadrennial international gathering of Western Hemisphere athletes.

The company acquired the sponsorship through the donation of $2 million worth of hardware and software for use by the Pan American X/I organization's MIS group.

The MIS operation is supporting the management of 27 athletic events to be held from Aug. 7-23. The organizers have

Continued on page 46

Emulator gases up I/O engine

BY STANLEY GIBSON
CW STAFF

SAN DIEGO — Data-Ware Development, Inc. recently announced a channel emulator capable of 4.5M byte/sec., a speed that is expected to become a standard for IBM and plug-compatible mainframes. The current channel speed is 3M byte/sec.

The Peripheral Automatic Channel Emulator (PACE) Model DW145 is expected to be particularly useful to developers of IBM plug-compatible mainframe peripherals, such as disk and tape drives, according to the vendor.

"Peripherals manufacturers can get to the market fast by using Data-Ware's channel emulator as an I/O channel substitute for an expensive IBM mainframe during engineering checkout and production tests," said Drew Sprague, a Data-Ware sales engineer.

A possible standard

Sprague said he concurs with the assessment of a number of industry observers that the faster channel speed will become a standard for printers, tape drives and disk drives.

"A lot of peripheral makers have faster speed capability built into their current products," Sprague continued, explaining that manufacturers in many

Continued on page 47

Inside

- Force adds Unix version of supermicro. Page 50.
- HP unveils monochrome display terminal. Page 50.

High-end minis elbow out IBM iron

BY DAVID BRIGHT
CW STAFF

LOS ANGELES — The University of Southern California (USC), one of the first customers for Prime Computer, Inc.'s new high-end 6350 superminicomputer, has purchased four of the systems as the final step in converting from an IBM 3081 mainframe to a distributed Prime environment.

Among the goals when the university started its conversion efforts three years ago were reducing costs, gaining faster response time and speeding software development.

"We found that running the IBM center was becoming more and more cost-prohibitive," explains Robin Pearse, director of computing. "We weren't able to develop new systems nearly fast enough for the administration, and we seemed to be mired in the existing applications. Also, the response time with the single 3081 was becoming unacceptable, so we decided to migrate to a system where we could divide and conquer."

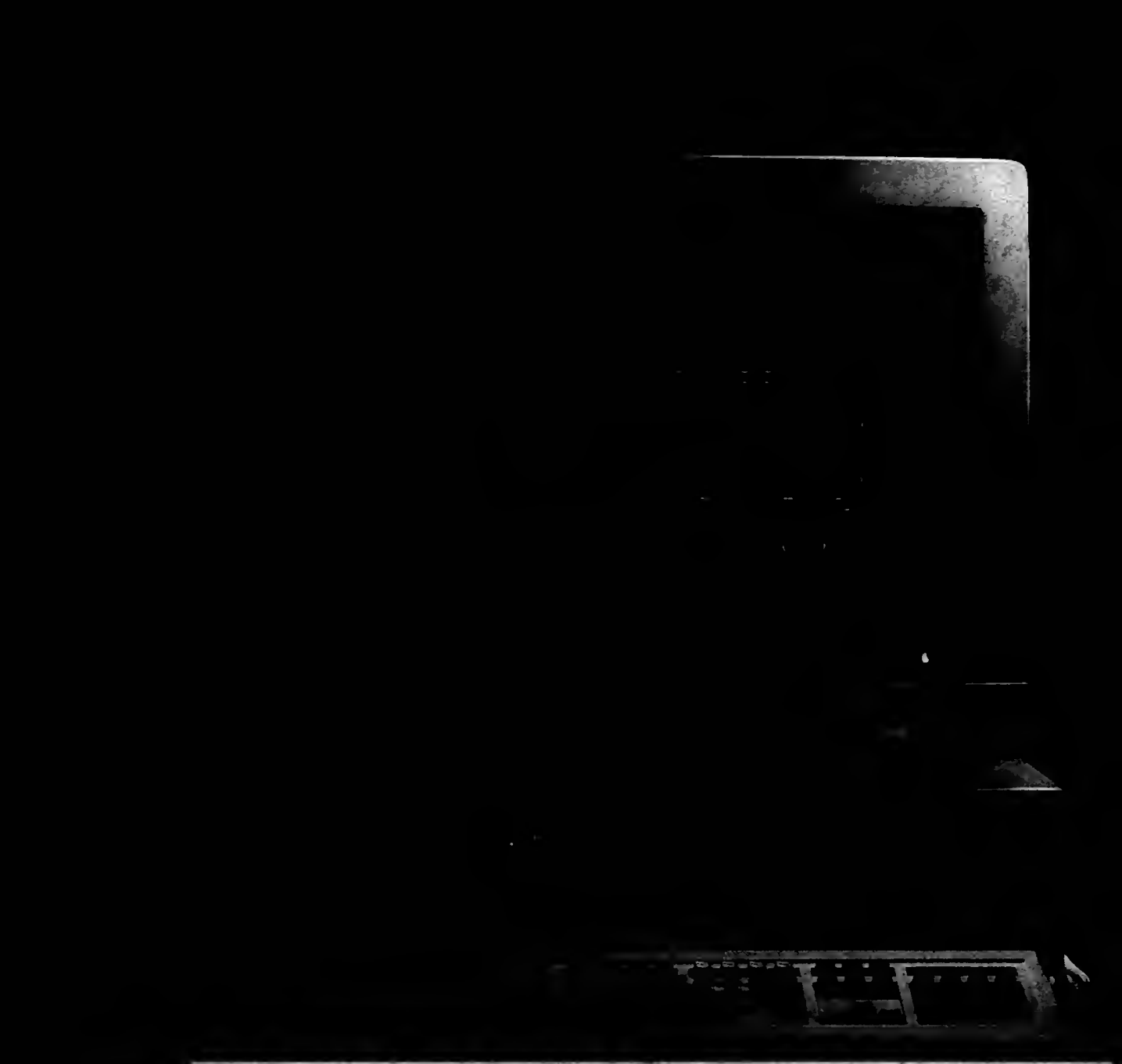
Having beta-tested a Prime 6350 for three months, USC says it plans to use the new systems for administrative processing. The 6350s, which Prime claims can each perform 11.8 million instructions per second (MIPS), will join seven of Prime's 9955 IIs already in place at the USC campus. The systems are linked together with Prime Net and the vendor's Ring Net token-ring method.

Prime says the 6350 can handle maximum disk storage of 50G bytes and can simultaneously support as many as 960 users. According to Prime, the 6350 can be upgraded to a 23.6-MIPS 6550 through the addition of a second processor. Although USC has been promoting a distributed environment, Pearse adds that using the more powerful new machines might enable the school to decrease the number of systems in use.

The primary software used on the machines at USC will be built around the Prime Information relational data base management system (DBMS) along with an applications generator, according to Pearse. He says he has been conducting benchmark tests that compare the 6350 with the 9955 II, and he is "pleased with the results so far." Plans call for the systems to go on-line by early fall, he says.

The systems will handle all of USC's administrative functions, including grade reports for close to 30,000 students, student recruitment and registration and the payroll for some 14,000 employees.

Continued on page 47



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Encore

CONTINUED FROM PAGE 46

tal expansion. With so many vendors, upgrade means removing a machine and bringing in another one. Here, it's like adding memory or a disk. You bring the system down, plug in the new boards and bring it back up, and the system recognizes that it has more processors and reconfigures itself," Shein says.

The manager responsible for bringing in the first Encore processors was Allan R. Thompson, associate professor of electronics, computers and system engineering at the College of Engineering.

The College of Engineering installed its first Multimax 120 in May 1986, as a supplement to a DEC VAX-11/780. "The thing we did was go for it, because the [VAX-11/780] was full and because we wanted Unix," says Thompson, who calls his Encore system "a gorgeous engine for VLSI design." He says the only significant failure for his three six-CPU systems came last July, when a CPU board burned out. He says he circumvented the failure and ran that system on four CPUs until the next morning, when Encore replaced the board in a 20-minute procedure.

Shein says the upgrade from the Multimax 120 to the Multimax 320 — including an operating system update — required only a few hours. He reports no significant reliability problem with either of the Encore models and says the relatively minor, short-lived difficulties have included a CPU board that was improperly seated and a disk failure.

The Multimax 320 is based on National Semiconductor Corp. 32332 microprocessors, while the Multimax 120 uses the older 32032 chip. The speed of the 32332, which is rated at 2 million instructions per second (MIPS), allows the university's Multimax 320 to perform 12 MIPS with six CPUs, compared with the 16 CPUs needed to provide the same power on a Multimax 120.

Shein, who says his center paid Encore standard university prices, notes that a Multimax 320 performs 12 MIPS for about $200,000, while that much power from DEC's VAX 8800 costs about $800,000. Boston University's system runs Encore's version of the University of California at Berkeley Unix 4.2.

Boston University's Multimax 320 supports 64 users at a time. However, Shein notes that an almost unlimited number of Ethernet connections can be added in increments of 16 through direct plug-in boxes on the Encore system.

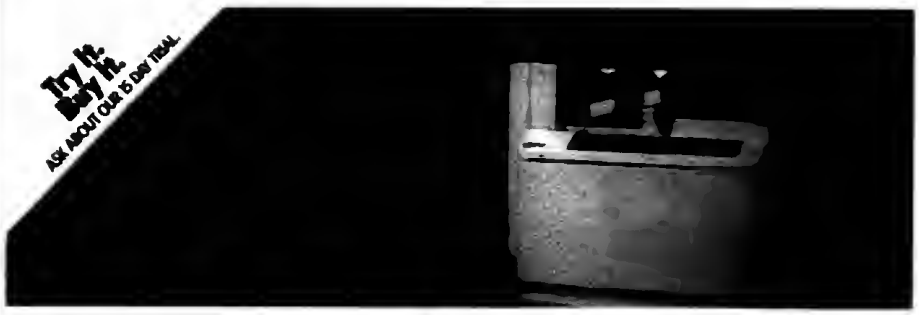
A fast Unix processor

While Encore promotes itself as a parallel processor supplier, Shein says little parallel processing has been done in the computing center. "Even if they are doing it, the only way I will know is if they tell me," he reports. Instead, what users see is basically a fast Unix processor. Shein says programming for parallel systems is not yet a curriculum subject at the university, but that he hopes a few faculty members work parallel programming into their courses on a limited basis.

Shein has run one benchmark to test the Multimax 320's parallel capabilities. In that ray-trace test, Shein broke the job into 30 parts to run on 16 processors on the Multimax 120 and 12 parts to run on six Multimax 320 Advanced Processor Cards. When running on a single processor, the job took 1,400 minutes on the Multimax 120 and 650 minutes on the Multimax 320. By running the job across multiple processors, Shein brought those times down to about 100 minutes.

Meanwhile, Thompson reports that faculty members in engineering have run parallel jobs on Multimax 120s. "My own perception is that it is faster than the VAX-11/780 on a per-board basis. On the surface it should be 4½ times a 780, but my observation is that it is six times as fast," Thompson said of his own performance tests on the Multimax 120.

Thompson and Shein also laud the Encore systems for their ability to port software with few problems. Thompson notes that the only difficulties his users experienced occurred when they used what he called illegal tactics, which the Encore system detected but other Unix systems might have missed.



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	IBM 5225	MegaLine Mod 5225
Lines/Min	280-540	3000
Characters/Line	136-198	106-198
Lines/Page	66-88	66-88
Twinax	Yes	Yes
Printer Type	Impact	Non-Impact
Protocol	5225	5225

The fact is, our MegaLine printer is twinax compatible with IBM Systems/36-38.

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Pan Am role

CONTINUED FROM PAGE 46

said they expect more than 6,500 athletes from 37 nations, 500,000 spectators and 3,000 media representatives.

Applications include English and Spanish word processing, security coordination, results reporting, protocol, housing, transportation, scheduling, accounting and warehousing and distribution of equipment and clothing, Prime said.

Communications services will be provided by Ameritech, which also has been designated as an official sponsor.

Prime systems in use include two 9950-II superminicomputers and a 9655 supermini, 68 personal computers and five Performer Office Automation Workstations. Prime also donated 192 PT200 terminals and 15 printers.

The games' organizers are using Prime Information, a fourth-generation language data base management system; the Prime Escape front-end system for application development under Prime Information; the Prime Simple program developer; Prime OAS office software; and Primelink communication software for personal computers.

Prime also provided training for 250 games volunteers and tactical support through its Carmel, Ind., offices.

DEC snores

CONTINUED FROM PAGE 43

about new products, why waste their time?

"Now, DEC holds these meetings based on how IBM held them in the past," says Bob Randolph, of International Data Corp.'s DEC Advisory Service. IBM actually won points over DEC in terms of frankness. Did we think we would ever see the day? In football jargon, DEC sat on the ball. But after DEC stalled, IBM scored a lightning touchdown on its next possessioo. Its recent consultants' round-up in Dallas was a smashing success.

"It was the most amazing user meeting I have ever been to. I was blown away," Randolph says. "The meeting was structured from a content point of view, like the old DEC meetings. It proved they [IBM] are *serious* about getting their fair share of the market."

Letting the numbers talk

In contrast to DEC's casual attitude to the performance of competing processors, consultants say, IBM has been assiduously testing all makes of computers at its Dallas data center. Its results are based in its proprietary Ramp C benchmark, and many results are not yet complete, but at least IBM had real figures to show the analysts at the roundup.

If IBM's meeting style appears to emulate that of previous DEC gatherings, it is almost certain that its mid-range strategy in general is a copy of DEC's. As Randolph expresses it: "For the last two years, IBM has been muddling around. Then along came DEC and pointed the direction. IBM watched their success and then said, 'Aha! that's the way to go. Now, how fast can we get there?' "

The tragic other side of the coin is that DEC has apparently looked longingly at IBM's traditionally high profits and said, "Aha! In order to compete, we must have those, too."

So DEC has asserted price control, slashed prices on workstations in what may be predatory pricing, brought out machines with extremely short life spans and closed the VAXBI bus.

Those who know the consultant community know that there are a few who would start a DEC cheering squad if they could. When they report bad vibes from a company they admire, it takes on special meaning.

And consultants also know they are being wooed by IBM. "IBM is trying to use the consultant community to gain ground against DEC. They pulled it off masterfully," Randolph says. But the fact is, consultants are saying that IBM is closing the mid-range gap between it and DEC.

Of course, DEC might have a trump card up its sleeve, which it could pull out at the upcoming Decworld show.

But in the latest battle for public opinion, score six points for IBM.

Gibson is a *Computerworld* senior writer.

High-end minis

CONTINUED FROM PAGE 43

Another school system planning to at least partially replace an IBM machine with four Prime 6350s is the Board of Education of the School District of Philadelphia.

The board has taken delivery of a machine and will begin a two-year implementation process next month, reports Richard Schoenborn, director of the school's computer network.

Currently, the board handles administrative tasks for approximately 196,000 students manually and with an IBM 4381. The 6350s will be used in conjunction with the 4381.

Software keys selection

Schoenborn says the main reason the Prime systems were chosen was the specially designed Skools software provided by Prime value-added reseller (VAR) Keystone Information Systems, Inc. in Maple Shade, N.J. That software is written in the Prime Information relational DBMS.

Like USC, Premier Systems, Inc. — a Prime financial services VAR based in Wayne, Pa. — has been beta-testing a 6350 since April. "It does perform up to the advertised speeds," says Marketing manager David DeParle. "It will let us move into areas dominated by mainframes."

Premier has sold 17 of the systems for delivery this year, notes DeParle, and is "already quoting upgrades" to the 6550, which is scheduled for fourth-quarter availability.

Emulator

CONTINUED FROM PAGE 43

cases need only adapt current products to the new speed, rather than create new equipment.

The DW145 also provides such other emulations as IBM mainframe channel I/O operation in selector, byte multiplexer, block multiplexer and data streaming modes, Data-Ware said.

The 4.5M byte/sec. speed is an increase of 50% above Data-Ware's current PACE Model DW110, which has an I/O channel transfer rate of 3M byte/sec.

The DW110 can be upgraded to the new speed, the vendor said.

The DW145 is priced at $19,950, with delivery within 45 days after receipt of order, according to Data-Ware.

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MAX FACTOR DID.

Max Factor's international operation has that vibrant glow about it. And Cullinet's Manufacturing System (CMS) software helped make it that way. The largest producer of its kind in Europe, Max Factor currently offers over 1,300 different cosmetics and fragrance items. Unit totals exceed 55 million annually. The key to success in the industry? Max Factor people believe it is keeping inventories low while at the same time maintaining a high service level on customer orders. CMS does just that. It's an advanced MRPII system that gives the 800 manufacturing and distribution personnel at the huge U.K. plant the capability to plan, control and react to real-world changes in a variety of manufacturing environments. Inventory and service objectives have become easy to attain. And the software has paid for itself in very defined terms over a short time. In the next five years, they plan to save five times their original investment. Obviously, CMS allows the best possible use of resources so that Max Factor, Ltd. just keeps looking better every day.

KAYSER-ROTH DID.

As America's second largest manufacturer of hosiery for men and women, Kayser-Roth understands that support is a key component of any software solution. That's why they selected the Cullinet Manufacturing System (CMS) featuring the Implementation Workbench for Manufacturing. This package of expert-based application and sophisticated implementation tools will enable Kayser-Roth to achieve an overall integration of information among departments. Their data exchange plans extend from PC to mainframe to user tools – between headquarters, multi-site plants and warehouses. Kayser-Roth's corporate managers use the Implementation Workbench for Manufacturing to enhance their implementation efficiencies, project planning and scheduling. Access to project status data helps meet target projections. CMS also provides superior on-line user documentation, interactive training and data conversion instruments, giving Kayser-Roth a most valuable tool for achieving its goals.

DIGITAL DID.

Digital Equipment uses Cullinet software to distribute Digital products. That's one of the highest compliments they could pay. Cullinet's Distribution Management System has allowed Digital to achieve real warehousing flexibility, because the same software can be utilized at multiple sites and still be tailored to the needs of each individual one. The ability of the system to be networked nationwide has provided Digital with the interconnectivity they were looking for. It has resulted in an optimum level of performance – one that has dramatically increased inventory turnaround. And Digital feels that Cullinet's vendor performance has been equally impressive. The distribution personnel say their success is shared with Cullinet – people who have become more like colleagues than vendors. Five Distribution Management products are available to companies like Digital: Order Management, Warehouse Management, Distribution Resource Planning, Distribution Center Management and Sales Forecasting. Digital knows how important these products are. Their clients believe that "Digital has it now," and Cullinet helps keep it that way.

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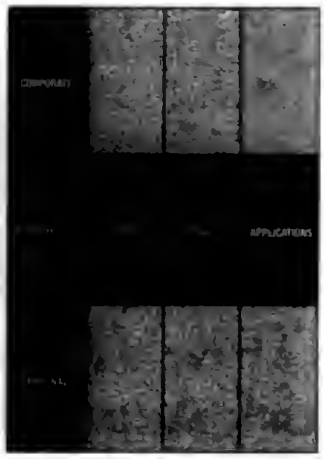
LHTEC DID.

The Light Helicopter Turbine Engine Company (LHTEC) did not exist as an entity until the U.S. Army instituted its T800 Full-Scale Engineering Development Program. T800 is the designated propulsion system for the LHX program to ultimately upgrade the Army's entire fleet of light helicopters. To accomplish that task within the Army's production competition strategy, the Garrett Turbine Engine Company of Allied Signal and the Allison Gas Turbine Division of General Motors joined resources for the Full-Scale Development (FSD) portion of the program. Even though these companies will become competitors during the production phase, FSD required they function as one, with a management process featuring fully integrated software and a state-of-the-art performance measurement control system. Cullinet's Manufacturing System (CMS) with EASYTRAK enabled easy linkage of files from cost, scheduling and technology standpoints. This project was accomplished across an 1,800-mile distance, with both partners having equal access to vital information simultaneously. And Cullinet managed to deliver up to 70% more savings in day-to-day operational costs than any competitive vendor LHTEC considered.

TECH FORM DID.

Tech Form Industries makes tubular exhaust components for automotive production. And when they needed a repetitive manufacturing system coupled with an automated release package, an exhaustive search led them to Cullinet's Repetitive Manufacturing System. This on-line, closed-loop, MRPII System software runs on VAX as well as other departmental platforms. Because of its exceptional automation of workflow and documentation, it is helping TFI meet the growing needs of original equipment automotive manufacturers around the world. Timely information turnaround has given Tech Form better tracking of investment balances. They can interface financial reporting with shop-floor data reporting systems. And because it's a stand-alone, in-house system – not a tie-in with an outside mainframe – it lets TFI realize the tremendous savings inherent in departmental, one-site computing. TFI products contribute to the performance of scores of domestic and foreign cars and trucks. And Cullinet's Repetitive Manufacturing System is helping to keep the company on the road to greater profitability.



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NEW PRODUCTS

Processors

Force Computers, Inc. has introduced a Unix version of its VMEbus-based supermicrocomputer system.

The **Force Focus 32/Unix System 25** is a desktop-size system said to support up to eight simultaneous users. It runs under the supplied Unix System V Release 2 operating system and contains read-only memory, random-access memory, hard and floppy disk drives and tape backup.

In its minimum configuration, it employs seven VMEbus boards, with space for five more.

A 460W, switch-mode power supply is standard.

In standard configuration, the Force Focus 32/Unix System 25 is priced at $424,950.

Force Computers, 727 University Ave., Los Gatos, Calif. 95030.

Data storage

Econopac, a family of mass-storage subsystems available in 280M-, 130M- and 95M-byte capacities and designed for use with Hewlett-Packard Co. computers, has been announced by **Bering Industries**, a wholly owned subsidiary of Mountain Computer, Inc.

Econopac subsystems are said to feature an average disk-access time of 27 msec. According to the vendor, they are 100% hardware and software compatible with HP computers using CS/80 and SS/80 command sets, including the HP 9000 Series 200/300/500, HP 1000 and HP 3000 computers.

The 280M-byte Econopac Model 5028 costs $9,490; the 130M-byte Model 5013 costs $5,390; and the 95M-byte Model 5009 costs $4,190.

Bering Industries, 280 Technology Circle, Scotts Valley, Calif. 95066.

The **Interceptor/36**, a series of nine-track ½-in. tape systems for IBM System/36 computers, has been announced by **Acknowledge, Inc.**

According to the vendor, data transfer rates for the series exceed 1.5M byte/min, and tape capacities range from 43M to 180M bytes. A menu-driven software utility is included with the systems, as well as a program that allows backups to be performed automatically at user-specified times.

Prices for the Interceptor/36 models range from $11,900 to $28,900.

Acknowledge, 100 Pennsylvania Ave., Framingham, Mass. 01701.

Terminals

The **HP Industrial Touch** monochrome display terminal has been announced by **Hewlett-Packard Co.**

The terminal is said to be compatible with the HP 2392 display terminal and with Digital Equipment Corp.'s VT52 and VT100 terminals. It accommodates touch-screen, bar code and key-pad input. The monitor is mounted on a tiltable base and features an electroluminescent display.

The HP Industrial Touch provides built-in, menu-driven, mouse-oriented forms and graphics-character editors. Multisize text and fields for data entry and graphics can be combined on a single screen.

The HP Industrial Touch costs $3,300. Accessories for touch-screen input cost $450; for bar code input, the cost is $300.

Hewlett-Packard, 1820 Embarcadero Road, Palo Alto, Calif. 94303.

Printers/Plotters

The **GBT 6090MP Print Station**, a tape-to-printer system, has been introduced by **General Business Technology, Inc.**

The print station includes the vendor's 6090MP 90 page/min. nonimpact continuous-forms printer, a dual-density magnetic tape drive and a personal computer-based controller with proprietary software.

Continuous forms are printed at a rate of 90 page/min. and print resolution is 240 by 240 dot/in. Four character sets are included. A graphics option that allows printing of signatures and logos is also available.

The GBT 6090 Print Station with 800/1,600 bit/in. tape costs $109,898; with 1,600/6.25K bit/in. tape it costs $115,858. The graphics option costs $16,549.

General Business Technology, 1891 McGraw Ave., Irvine, Calif. 92714.

Power supplies

Modular Power Corp. has introduced **Upstar**, a modular uninterruptible power supply, and **Gemini**, a power distribution center for large power system users.

Upstar is made up of a series of 9- by 9- by 16-in. power modules. Each module provides 12 kVA of power. Users can start with a power system as small as 12 kVA and expand it up to 360 kVA in a single unit. Upstar includes a built-in CRT.

Gemini is said to guard computer systems against power disturbances and to provide monitoring capabilities.

Upstar is priced starting at $30,200. Gemini costs $4,945 and up.

Modular Power, 1150 Ringwood Court, San Jose, Calif. 95131.

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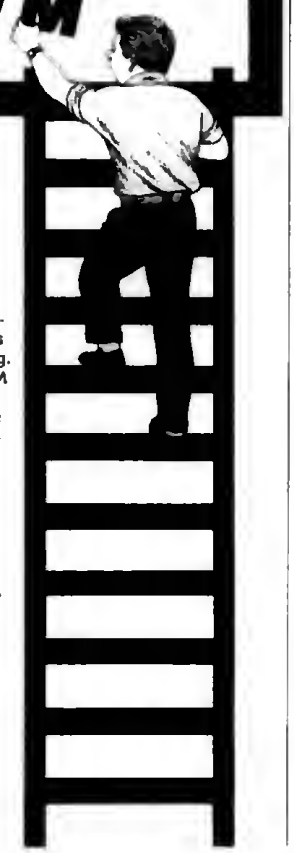

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TPX and Network Access in VM

TPX/VM (Terminal Productivity Executive) is a full-function session manager specifically developed for users of ACF/VTAM. With TPX/VM, you can select desired applications from a full-screen menu and have simultaneous, active sessions. TPX/VM also allows easy switching from one application to another with a single command or PF key.

Reducing tedious logon and logoff procedures immediately increases user and system productivity. "Automated Conversation Language" (ACL) lets you pre-program your responses to standard procedures and automatically activate sessions when logging on to TPX. And if you move to another terminal, TPX/VM's session portability lets you take your sessions with you.

Network Access/VM is an ACF/VTAM application that replaces VTAM's limited USS (Unformatted System Services) Table. It provides you with menu-driven access to all your applications while maintaining application-level security. With Network Access/VM, you can communicate with other network users with system-wide message sending.

TPX/VM and Network Access/VM work effectively in a stand-alone or integrated mode to improve the productivity of your network users and optimize resource usage. TPX and Network Access have received "rave reviews" from MVS users at over 800 sites worldwide. Now VM users can experience the same benefits.

To arrange a FREE, 30-day trial of TPX/VM or Network Access/VM, call toll-free, (800) 323-2600 or (412) 323-2600 in Pennsylvania.

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How to keep eagles

Can you hold on to the best programmers on your staff?

BY ROBERT ZAWACKI

As our systems become more dated and we shift our focus increasingly toward maintenance and away from development, it becomes even more important to select the right staff and, once selected, to manage it to increase productivity.

Much development work is being replaced by software purchases, and many of the "rich" jobs in systems development are becoming less rich or more narrow in scope. MIS must become creative to hold on to top staff members and keep them motivated.

A complicating factor is that MIS managers are promoted on the basis of their technical skills, not their management skills. Often, they look for job satisfaction in technical areas; for them, managing workers is a need of a lower order.

As a rule, these managers prefer to stay current in technology, saying that "tomorrow" they will get to the people problems. A typically high need for achievement, combined with a low need for social interaction, forces them away from performing the management functions that increase the motivation and productivity of programmers and analysts.

One firm that has recognized this problem is IBM. About five years ago, Dan Giles, IBM'a director of MIS education in Dallas, included a course called "Motivating and Managing Computer Personnel" in his technical curriculum for MIS staff at IBM. This course is popular with IBM'a MIS managers because it is the only course that treats human resource problems in a technical environment rather than in a generic business environment.

Zawacki is a professor of management and organizational behavior at the University of Colorado in Colorado Springs.

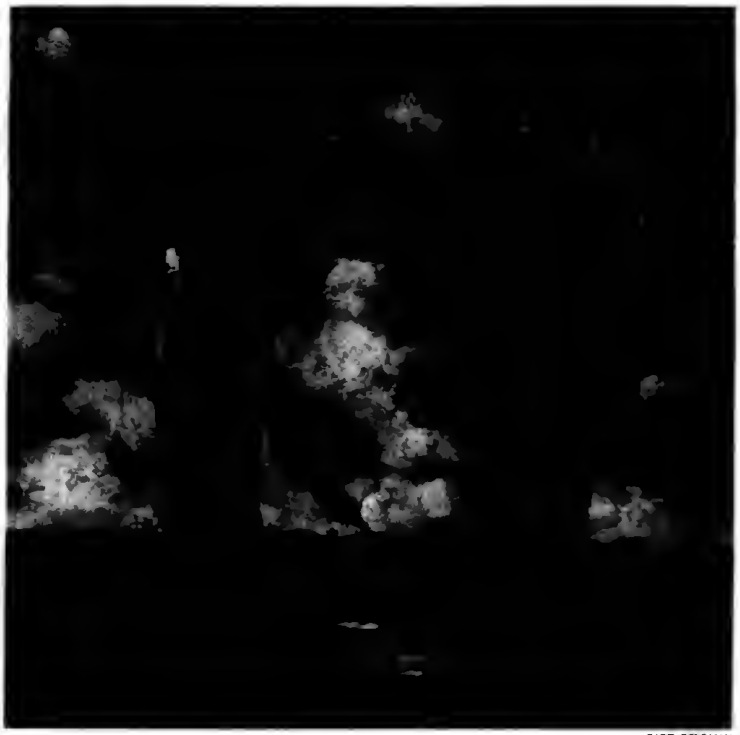
Increase motivation

From my research and consulting with various MIS organizations for the last 10 years, I have found that MIS managers can be quite successful at moving "eagles" toward higher motivation and productivity. Management courses designed for MIS managers should emphasize the characteristics of MIS personnel and then discuss the skills that are required to motivate them.

Also on the positive side, MIS managers typically respond very well to goals because of their high need to achieve. Management workshops, to be effective, must conclude with action plans that the managers implement back at the ranch. Unless the workshops are translated into meaningful skills and goals, managers go back to work only to be seduced by the daily technical crises — at the expense of implementing their new knowledge and skills.

Just what are the variables that increase the motivation and productivity on the human side of MIS? You can keep eagles on your staff by implementing any or all of the following:

- Design high-profile jobs and place in those jobs staff members who desire challenge, achievement and meaningful work.
- Set challenging yet achievable goals with specific deadlines (i.e. measurable success).
- Reward desired performance and behavior by applying intrinsic and extrinsic rewards.
- Recognize that MIS prosionals constantly evaluate



BART GOLDMAN

- **Hiring eagles is only half the battle**
- **Maintenance vs. motivation**
- **High achievers need to be stretched**

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managers' fairness.

• Apply a contingency approach to leadership. This means applying the appropriate management style to each performance-satisfaction variable: job performance, skill variety, task identity and significance, autonomy and feedback.

These variables are key to retaining motivated and productive DP professionals. The list does not explain all behavior of DP professionals but gives the MIS manager a checklist for maximizing individuals' productivity while minimizing the time he spends.

More than 50% of a DP professional's motivation and productivity stems from the matchup between the person and the job. A two-by-two matrix describes all the possible matchups in a DP organization (see chart at right). In general, the scope of the job — measured by its motivating potential score (MPS) — needs to match the staff member's need for achievement — measured by his or her growth-need strength (GNS).

Job scope ranges from high to moderate to low. Systems development is an example of a high-scope job; maintenance is a moderate-scope job; a computer operator position is a lower scope job. DP professionals perceive a job as high in challenge — high scope — if it brings a high degree of the following dimensions to the job:

Job fit matrix

Most of a DP professional's motivation and productivity stems from the matchup of personal needs and job scope

CW CHART: AMY J. SWANSON

Skill variety. The degree to which the job requires a variety of different activities, which in turn involve the use of a number of different skills and talents.

Task identity. The degree to which the job allows the completion of a whole and identifiable piece of work with a clearly visible outcome.

Task significance. The degree to which the job substantially affects the lives or work of other personnel — whether in the immediate MIS organization or in the external environment.

Autonomy. The amount of freedom, independence and discretion employees have in scheduling their work and in determining the procedures to be used. Goals are set, and employees are given latitude.

Feedback from the job. Specifically, the amount of information received about the worker's effectiveness.

Best predictor

Once the scope of the job is defined, an MIS manager should attempt to determine the matchup of the person with the job. I have found that the best predictor of job performance is an individual's need for achievement. An MIS manager cannot match every worker with the best possible job; however, he can make a real effort to reduce the number of mismatches in Cells 2 and 3 (see chart), in which a high achiever is matched with a low-scope job. High achievers — those with high GNS — express a driving need to grow, to move beyond where they are, to be constantly stimulated, to be stretched and to receive feedback and recognition.

A manager should examine the matchup throughout the interview process as well as during job rotation, when he is changing the scope of the job and when he is setting goals.

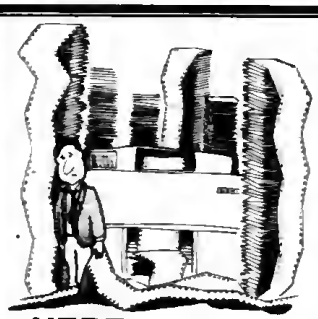
Once managers have matched people and jobs to the best of their abilities, they need to examine their own goal-setting behavior. High achievers desire autonomy; however, that autonomy must not be seen as a kind of "do your best" or laissez-faire management.

A manager can change the individual contributor's perception of the job by increasing autonomy and feedback. The degree of autonomy you permit must be based on each contributor's experience, skill and maturity. The secret is to stretch your high achievers to their fullest potential.

Challenging goals

DP professionals desire goals that are challenging yet realistic and achievable in a reasonable time frame. If the goal is set too low, they will not experience job satisfaction. If the goal is too hard or too far in the future, they become frustrated.

Goals for high achievers can be established by the MIS manager or in a joint management-by-objectives manner. Either method will produce results, but if the MIS manager has the time,



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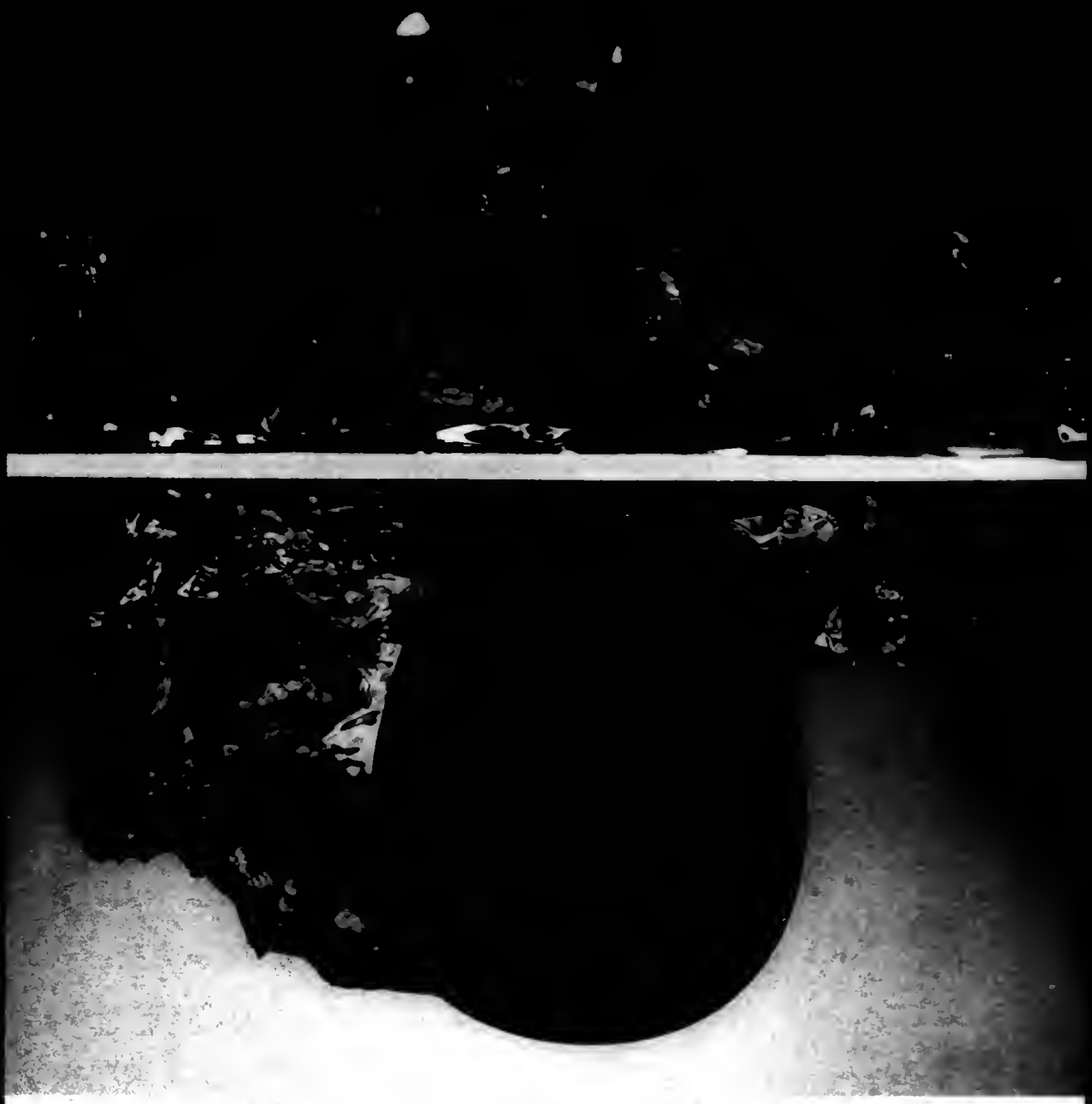

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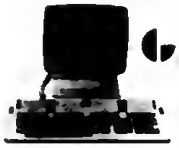

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joint goal setting will increase the quality of the goal and inspire more commitment to it.

The MIS organization at Travelers Insurance Co. recognizes the importance of goals in its training program. Frank Collins, second vice-president, and Sandra Ginnis, manager of training and development, require their managers who attend management courses to complete a "goal form," which defines training goals, the person responsible for taking action and the resources required to reach the goals.

Collins and Ginnis say that the primary shortcoming of most management training is that managers attend training sessions, approve the content and rate the courses as "good" or even "excellent" but then go back to the DP shop and soon return to old management methods. To institutionalize their MIS management course, Collins and Ginnis require all attendees to complete the goal form and discuss their stated goals with their managers within two weeks of completing a course.

Model of an effective manager

MIS managers and systems personnel rated these traits highest in their view of an ideal manager

Competency	Priority: Low 1	2	3	Medium 4	5	6	High 7
1. Technical skills							
2. Feedback skills							
a. Feedback on goals							●
b. General feedback							●
3. Matching people and jobs							●
4. Sets goals and then gives autonomy							●
5. Gives staff a sense of involvement						●	
6. An effective listener and counselor						●	
7. Provides for career development						●	
8. Lets people in on the "big picture"						●	
9. Provides an effective role model					●		
10. Develops team work					●		
11. Relates rewards to performance							●
12. Is perceived as getting a "fair share" of total budget and rewards						●	
13. Is perceived as effective in working at internal and external pay equity							●
14. Negotiation and consulting skills							
a. Customers/users					●		
b. Peers and subordinates					●		

CW CHART

Management commitment

Another MIS department that rewards desired behavior is that of Prudential Property and Casualty Insurance Co. After Prudential managers attended a course on motivating computer personnel, J. Kenneth Golder and William R. Graff, both vice-presidents of MIS, met with the senior management team and the instructor to review the course content and translate it into specific action plans. They thereby demonstrated to their organization top management's commitment to ongoing training and growth.

The more programmers or systems analysts can relate rewards to desired behavior, the higher the probability that they will repeat that behavior. An MIS manager should define desired behavior and performance levels and then attempt to give rewards to high performers.

This may sound good in theory; however, my experience is that some managers want to be warm, friendly helpers and do a fair job of setting goals and deadlines, but when it comes to merit-increase time, they tend to give most or all employees equal rewards. These managers do not want to look an employee in the eye and tell him his performance is below average. But most of the time, their efforts to be evenhanded and to please everyone backfires: Each staff member perceives his reward as inequitable.

Reward checklist

The two-factor theory of intrinsic and extrinsic rewards conceived by Fred Herzberg (one of the original researchers on motivation theory in industry) still provides the best checklist for MIS managers looking to motivate their employees and reward

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Philadelphia	10/6
Phoenix	11/4
Pittsburgh	10/8
Portland	10/6
Raleigh, NC	10/27
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them appropriately:

Maintenance factors are the extrinsic rewards, those that come from sources outside the individual. They include the following:

— Company policies and administration.
— Work conditions.
— Supervision.
— Job security.
— Pay and benefits.

Motivation factors are the intrinsic rewards; that is, those that gratify the individual from within. They include the following:

— Achievement.
— Recognition.
— Advancement of growth.
— Responsibility.
— The work itself.

Herzberg never says not to provide the maintenance factors. Firms must provide maintenance factors to the degree necessary to attract and keep eagles. Maintenance factors may be only the foundation on which to build, but it does not do any good to talk about meaningful work if the foundation is crumbling. However, in most MIS organizations, the foundation is very solid, and MIS managers can concentrate on providing staff members with recognition, opportunity for advancement and achievement. Remember, 50% to 60% of an MIS professional's performance is a result of the job's matchup with the person and its intrinsic motivation.

Eagles believe in fairness

After matching people (GNS) and jobs (MPS), setting goals and deadlines and allocating rewards, MIS managers can turn their attention to another matter: fairness. Realize first that individual staff members constantly evaluate the fairness or equity of their boss.

The research of behavior scientists indicates that workers bring input to their jobs and expect certain outcomes. Input includes experience, education, skill, aptitude, effort and commitment. Outcomes include working conditions, pay, benefits, recognition, opportunity for growth, achievement and autonomy.

Individual contributors believe the MIS manager and organization are fair if this ratio is approximately 1-to-1. If the employees' perception of this ratio is not 1-to-1, they will experience what psychologists call "cognitive dissonance" — a state of being mentally uncomfortable — and they will try to compensate. They may first seek greater challenge, recognition or reward to fit what they feel they bring to the job. If these are denied, they may adjust — that is, lower — their productivity to achieve a perceived balance, or they may resign if they believe there will be no improvement in the near future.

MIS personnel evaluate their manager's fairness subjectively by looking at the following variables:

- Latitude — the amount of autonomy the employee has.
- Pay and benefits relative to co-workers.
- Pay and benefits relative to other MIS organizations.
- Raises and promotions.
- Pace of work activity. They expect to work long hours, but they also expect management to recognize their efforts.
- Distribution of high-visibility jobs.

Five of these six variables are under direct control of the manager. The only uncontrollable factor is fairness of pay relative to other organizations. Thus, managers should encourage the personnel department to offer current comparative pay studies for people to review.

SOME MANAGERS want to be warm, friendly helpers and do a fair job of setting goals and deadlines, but when it comes to merit increase time, they tend to give most or all employees the same rewards.

From my research with and consulting in MIS organizations, I developed a checklist of the competencies of an effective MIS manager. To validate it, I asked Tom Streett and Dick Benashski of the Hartford Insurance Group to head a team of 14 MIS managers who brainstormed the competencies of an effective MIS manager. Their list had a 90% correlation with my research and consulting. I further validated the list by asking systems personnel to comment on the behaviors of an effective manager — for example, what they want an "ideal manager" to do (see chart page 56).

This competency model shows that effective managers can possess an average level of technical skills but are expected to be above average in human (interpersonal) and management skills. Yet because most managers are promoted to management on the strength of their technical skills, something in the back of their minds is still saying, "I must stay current in the technology."

In addition, it turns out that keeping current on technological developments is what meets their high need for challenge. Performing management tasks does not meet this basic need for most technical managers because many organizations do not adequately reward good management behavior. If a corporation wants to keep MIS eagles who are motivated and productive, then senior-level management must recognize and reward the competent MIS managers. •

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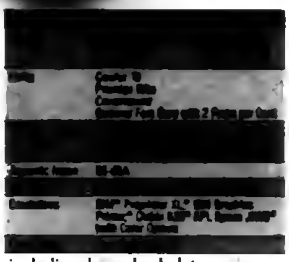

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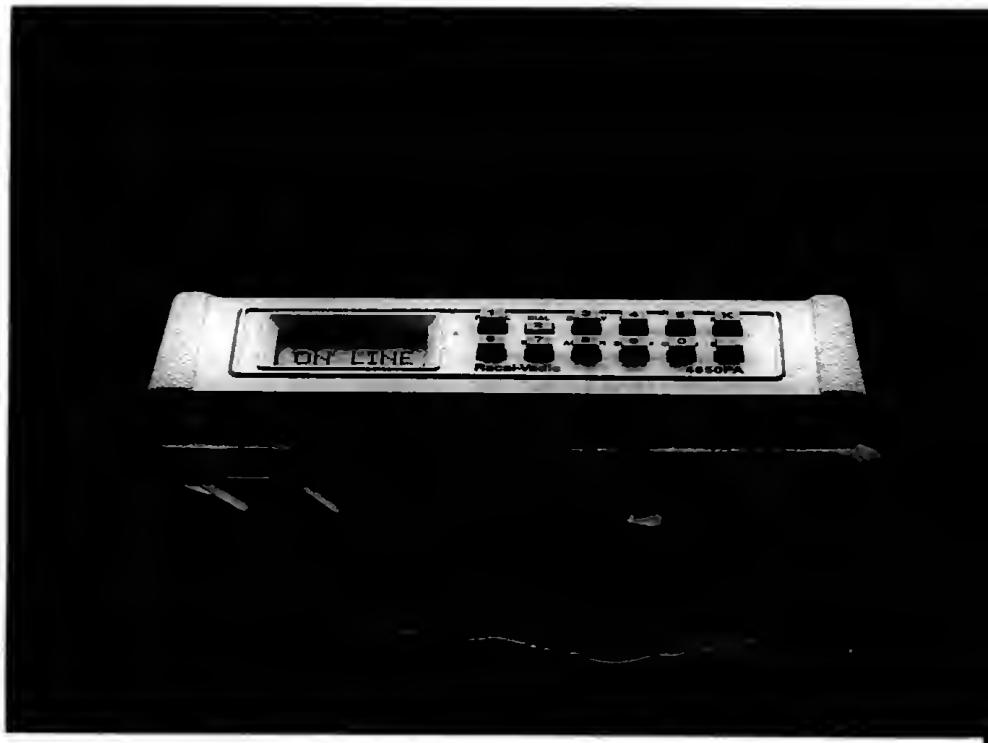

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David Ludlum

1706: Unite and move on

"Some of its noisiest authorities insisted on its being received, for good or for evil, in the superlative degree of comparison only."

So Charles Dickens characterized the period leading up to the French Revolution in *A Tale of Two Cities*, noting that the description also applied to his own time 80 years later.

It seems true today, too, at least concerning some of the supporters and opponents of Section 1706 of the Tax Reform Act of 1986.

Section 1706 has required many former free-lance and independent computer programmers, analysts and consultants to forfeit their independent status for federal tax purposes and be classified as employees of firms that had brokered their services.

The law has aroused an outcry from many of those independents. They suggest the legislature was prompted by anticompetitive aggression on the part of computer services firms that already work through employees and by discriminatory federal revenue raisers insensitive to the nation's need for a flexible technical work force.

Now, apparently for the first time, one party in this contro-

Continued on page 65

Rockart exhorts line to lead

Calls for MIS to play supporting role in 'Wired Society'

John F. Rockart, director of MIT's Center for Information Systems Research and author of the Critical Success Factors strategic planning method, now outspokenly advocates line managers assuming leadership of the development of information systems. Rockart kicked off the center's latest week-long summer session with an address entitled, "The Emerging Partnership Between MIS and Line Management." He recently discussed the evolution of the need for line leadership with *Computerworld* Senior Editor David Ludlum, when he noted that he generally delivers the same address under the title, "The Line Takes the Leadership."

MIT's John B. Rockart

When did you develop the notion of the partnership, and what brought that about?

I think the partnership is certainly not something I developed. That idea has been kicking around for the last few years as an expression of a need for the line's heavy involvement in the development of systems.

The phrase that is perhaps attributable to this place is the need for the line to take the leadership. That's a notion that came out of talks with several of the sponsors of this center. One most particularly, Dudley Cooke of Sun Co., has been telling his management for the last several years that he can install the equipment, but the real payoff comes from changing their organization, changing the way people are doing their jobs and making the changes only the line management can make.

I tend to take it one step further. It seems to me that no matter how good the information systems people are these days, they cannot understand fully what the strategy of a particular manager is — [not] enough to really design the key systems. In short, line management has got to understand enough about the technology to envision its use in their strategy.

What types of changes are necessary to make these systems pay off?

There is a need to change the organization; often the organization's structure, sometimes people, sometimes the way a job itself is performed and, quite often, some of the other systems — such as the accounting system or the reward system — which surround the information technology use.

Is the need for line leadership a response to a changing technological environment?

Yes, it is.

It sounds, to some extent, like this is something that should have been going on all along.

Not really. I divide the information technology world into four eras. The first era, we put in accounting systems. Information technology people could do all of that. The conceptualization was not difficult. Payrolls looked very much like one another.

As we got into the second era, however, which I call the operations era — the era of on-line technology as opposed to batch technology — we started dealing with systems in order entry and manufacturing control. And MIS, after trying to do it exactly the same way, realized they couldn't. One manufacturing control system didn't look exactly like another, and therefore we came up with the term "involvement." The line had to be involved.

In the third era, we moved to fourth-generation languages, personal computers — end-user technology — and here, some members of the line took the ball into their own hands. They said, "The hell with MIS; I'm doing my own thing with my PC." Slowly but surely, however, they learned that there needed to be a partnership. MIS had much of the data and had to supply that data. In addition, the PCs had to connect to the mainframes, and therefore the network was important. Slowly but surely, a partnership has been worked out where MIS sets standards and network configuration.

The fourth era's technology is totally different. On the surface, it looks the same. We're dealing with PCs and maxis and minis. We're working with some of the old applications for order entry and manufacturing control. The big ingredient, however, is communication technology. The technologies today allow for integration among companies and among functional organizations within a compa-

Continued on page 64

Anxieties stymie mergers

BY ADAM STONE
CW STAFF

Merged banks are finding that consolidating their technical facilities often turns out to be neither as easy nor as profitable as they expected, according to a recent study.

Cost reductions in data processing, systems development and maintenance are an important reason why banks merge, but when incompatible MIS cultures and operating philosophies get thrown together, problems will inevitably arise in the transitional process, according to a study conducted recently by The Diebold Group, Inc. in New York.

In general, mergers breed anxiety on the part of personnel who face uncertainty and possible layoffs, which tends to reduce productivity during the transitional period, the study found. Therefore, the report suggests, a rapid transition is essential for successful consolidation.

"Until you decide what you're going to do, you have a very unsettled period," said Mark Klein, vice-president at Diebold. "The longer you postpone the decision, the more difficult it's eventually going to be to do it."

Whether two banks should consolidate their existing systems or eliminate one of them should depend primarily on the banks' products and the goals of their merger, according to Klein. "People are more willing to work that way — when they believe that what's being done is

Continued on page 60

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Anxieties

FROM PAGE 59

what's best for the business and not just politically motivated," he said.

According to the Diebold study, there are three key ways in which banks' efforts to consolidate operational systems and DP resources can go amiss:

- Often, the senior bank will impose its technology and philosophy on the junior bank. Klein called this "technological imperialism." What the senior bank often fails to recognize is that while it is genuinely superior in some areas, its MIS facilities may be inappropriate for achieving greater aims, Klein said.
- Sometimes, two banks of equal power both believe their way is best, which creates a win-lose atmosphere rather than aiding in working toward their mutual benefit.
- Managers will sometimes effect departmental reductions and staff eliminations that are not the most cost-effective or productive in order to avoid making more difficult choices or out of loyalty to long-standing personnel.

To consolidate their information systems, banks should assess their respective situations, base decisions on an objective analysis of benefits and learn from previous mergers, according to the Diebold study.

A recent seller's market in bank acquisitions has driven up the prices of banks and put pressure on buyers to recoup expenses, the study found.

CALENDAR

AUG. 2-8

Recognition Technologies Users Association Annual Forum: Remittance and Document Processing. San Francisco, Aug. 2-5 — Contact: Recognition Technologies Users Association, P.O. Box 2016, Manchester Center, Vt. 05255.

25th Annual Conference of the Urban and Regional Information Systems Association. Fort Lauderdale, Fla., Aug. 2-6 — Contact: URISA, 319 C St. S.E., Washington, D.C. 20003.

Resource Access Control Facility Users Conference. Anaheim, Calif., Aug. 3-7 — Contact: Vanguard Integrity Professionals, Suite 109, 1720 E. Garry St., Santa Ana, Calif. 92705.

Symposium on the Simulation of Computer Networks. Colorado Springs, Aug. 4-7 — Contact: Computer Science Department, University of Colorado, Colorado Springs, Colo. 80933.

Desktop Productivity Conference. Boston, Aug. 5-7 — Contact: The Seybold Group, Inc., Suite 100, 100 Homeland Court, San Jose, Calif. 95112.

Extending the Human Mind: Computers in Education. Eugene, Ore., Aug. 6-9 — Contact: University of Oregon Continuation Center, 1553 Moss St., Eugene, Ore. 97403.

AUG. 9-15

Spocade III CAD/CAM Conference. Coeur d'Alene, Idaho, Aug. 9-11 — Contact: Spocad, E. 502 Boone Ave., Spokane, Wash. 99258.

RDB Frontiers '87. Boston, Aug. 10-14 — Contact: The Relational Institute, Suite 106, 6489 Camden Ave., San Jose, Calif. 95120.

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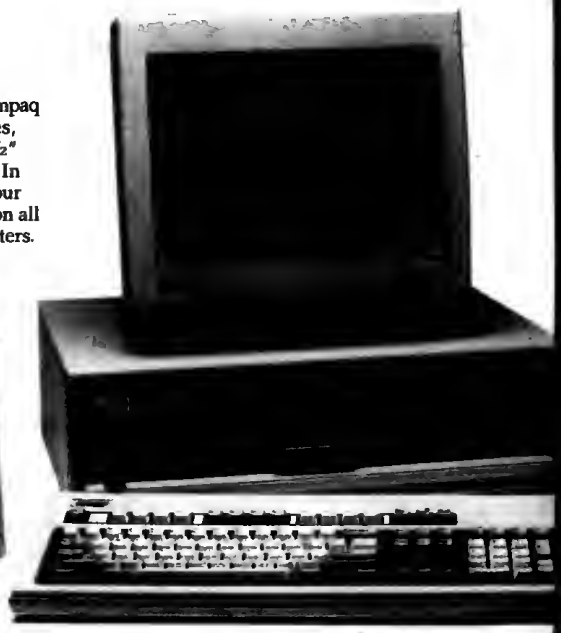

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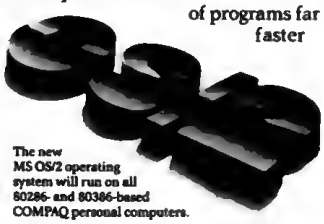

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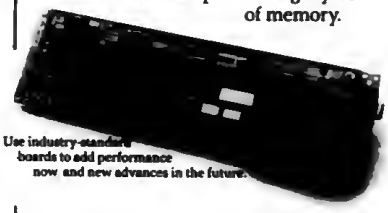

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BOOK REVIEWS

Grove offers management to the masses

One-on-One with Andy Grove: How to Manage Your Boss, Yourself and Your Coworkers
By Andrew S. Grove

Managers looking for a methodical recipe for success or a theoretical discussion of employment policies should not read this book. In *One-on-One*, Andy Grove, president of Intel Corp., calls upon more than 20 years of management experience to offer quick-witted, brief responses to a potpourri of queries from bosses as well as employees.

Grove's bold style and reliance on straightforward answers challenge the lofty, more distant tone of many of the management books on the market. *One-on-One* gives the reader the feeling that he is sitting across from Grove in the company cafeteria, receiving blunt advice on office conflicts from an understanding friend.

Though Grove heads Intel, the advice he gives and the questions he addresses apply to any work environment, technical or nontechnical, and deal with problems of management and communication rather than the content of the work.

Organized in 20 short chapters, the book is a collection of advice columns from Grove's role as the "Dear Abby of the workplace" for the Knight-Ridder, Inc. newspaper syndicate. After an introduction detailing his own work experience, Grove leads each section of each chapter with general comments.

From the first chapter — entitled, "I Hate My Boss" — to the last, in which Grove advises, "Be Leery of Fads and Stereotypes," the Intel executive concentrates on clarity and honesty in dealing with management issues.

One-on-One can best be summed up with the five key principles Grove states at the end of the book: Enjoy your work, be dedicated to its substance, respect the work of others, be straight with everyone and "always, when stumped, stop and *think* your way through to *your own* answers."

Hardcover, $18.95, 235 pages, ISBN 0-399-13250-3, by G. P. Putnam's Sons, New York, N.Y.

MICHAEL SULLIVAN-TRAINOR

BOOKS IN BRIEF

The Electronic Mailbox
By Ira Meyer

An overview of electronic mail options geared to the small or medium-size organization.

Paperback, $16.95, 198 pages, ISBN 0471-62576-0, by John Wiley & Sons, Inc., New York, N.Y.

Data Communications and Distributed Networks
By Uyless Black

A solid introduction to data communications systems and networks presented without communications jargon.

Hardcover, $37, 468 pages, ISBN 0-8359-1341-4, by Prentice-Hall, Inc., Englewood Cliffs, N.J.

Advanced CICS Design Techniques, Concepts and Guidelines
By Joseph Summerville

How developing innovative designs grows from an understanding of basic CICS, including temporary storage, transient data and automatic task initiation.

Paperback, $27.95, 258 pages, ISBN 0-442-28213-3, by Van Nostrad Reinhold, New York, N.Y.

SNA: IBM's Networking Solution
By James Martin

SNA explained — the concepts, protocols, functions and capabilities.

Hardcover, $48, 380 pages, ISBN 0-13-815143-1, by Prentice-Hall, Inc., Englewood Cliffs, N.J.

Publishers wishing to have their books considered for review can direct books, prepublication galleys, press releases, catalogs or other information to George Harrar, Book Review Editor, Computerworld, *P.O. Box 9171, 375 Cochituate Road, Framingham, Mass. 01701.*

Rockart

CONTINUED FROM PAGE 59

ny. Those integration processes require the breaking down of organizational boundaries. And those are applications of what I call the fourth era, or the Wired Society; ones which are not simple to implement, require transforming of the way we do business, transforming of the organization structure and, therefore, require line leadership.

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1706

CONTINUED FROM PAGE 59

versy has suggested that those on both sides get together and resolve their differences face to face. More on this in a moment. First, a bit of perspective.

With Section 1706, Congress has singled out computer professionals and other technical specialists, but only to reinstate for that group the common-law standards that the Internal Revenue Service traditionally has used to determine whether someone is an employee or an independent contractor.

The chief reason is that computer professionals have flooded the "safe harbors" that Congress lazily approved in 1978 to provide what was supposed to be a temporary removal of the common-law standards. The approval of Section 1706 was thus consistent with the widespread congressional moves against tax avoidance enacted through last year's sweeping tax reform.

Getting a perspective on Section 1706 requires looking back to the legislation that it amends and to the confusion that spawned that earlier law.

The roots of the current controversy lie in complaints voiced in the late 1970s about the IRS's inconsistent enforcement of the common-law standards for determining who is an employee and who is an independent contractor for the purposes of federal taxation.

Those complaints led Congress to pass what was intended to be a temporary, stopgap safe-harbor measure that essentially gave the benefit of the doubt in many controversies over employee status to those who wanted to file tax returns as independent contractors. That was Section 530 of the Revenue Act of 1978.

Section 530 only addressed the year 1979. It said an organization did not have to treat a person as an employee for tax purposes that year as long as it consistently did so and had a reasonable basis for doing so. A reasonable basis could be a "long-standing, recognized practice of a significant segment of the industry in which such individual was engaged."

That allowance for a long-standing practice threw the door wide open to DP professionals and consultants seeking independent status; those in most occupations lacked such a widespread tradition of independent contracting.

But there was a catch. These provisions did not apply to individuals if, for tax purposes, the organization in question treated anyone else with a similar position as an employee in 1978 or 1979.

Congress suggested it would provide a clearer and more permanent definition of independent status when it included in Section 530 a provision barring the IRS from issuing rulings on the matter before Congress enacted a subsequent law that clarified the situation.

Taken into the safe harbor

But Congress extended Section 530 indefinitely. In the meantime, hordes of computer professionals have taken advantage of the safe harbor. Proponents of Section 1706 — those arguing on behalf of the Department of the Treasury's coffers and those arguing for technical-service firms — claim that many computer professionals overstepped the bounds of the safe harbor and caused their would-be employers to do so by violating the provision requiring that the organizations treat similar positions the same way.

In addition to cutting into the take of the federal treasury, this practice piled a growing liability on the bulk of technical service firms that turned a blind eye to violations of this consistency clause. Should they be audited, these firms could be held liable for taxes that they should have been withholding, and their clients could be held liable for some of the money if the firms couldn't come up with it.

In a nutshell, Congress opened a safe harbor for likely independent contractors in 1978, a conspicuous number of computer professionals sought refuge in the harbor, and now, Congress has decided to reimpose its traditional common-law standards on those professionals.

Several bills to delay or repeal Section 1706 have been introduced to congressional committees, and scores of lawmakers can tell concerned constituents that they have signed on as co-sponsors. But these measures have gone nowhere fast in a Congress considering new taxes at a time when its budget office predicts the federal deficit may grow in 1988 and 1989.

Amid this stalemate, one admitted supporter of Section 1706 has called for both sides of the controversy to get together and devise a compromise so that the industry can move ahead.

That proposal was voiced during a visit to *Computerworld* by Joel Brust, founder and recently retired president of Amtec Systems Corp. in Los Angeles, a subsidiary of the Computer Task Group, Inc. in Buffalo, N.Y. Amtec has provided technical services through both employed and contract professionals.

Brust says that current independent computer professionals who don't come close to meeting the common-law standards governing employee status should accept reclassification as employees. Meanwhile, proponents and opponents of Section 1706 should get together to resolve any gray areas arising from Section 1706 or from the common-law standards and to address any legitimate concerns regarding employee status that are peculiar to the computer and data processing industries.

Ludlum is *Computerworld's* senior editor, management.

to conclusions

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COMPUTER INDUSTRY

INDUSTRY INSIGHT

Clinton Wilder

Toshiba ban no solution

The formulation of U.S. high-tech trade policy is always a tricky business.

In attempting to protect and further U.S. economic interests, Congress and the administration must first agree on what those interests are. Then they must seek a delicate balance among diverse industry groups in a complicated world of international joint ventures, transcontinental OEM agreements and offshore product sourcing.

Even under the best circumstances, that goal is elusive. But when the process becomes overrun by protectionist fervor and a national security hysteria that must be making Ollie North proud, attainment of the objective is completely hopeless.

The current Toshiba Corp. submarine-technology affair [CW, July 6] represents the worst excesses of economic decisions being made for political reasons.

In attempting to mete out the proper punishment for Toshiba Machine Co.'s egregious offense of selling sensitive defense technology to the Soviet Union, Congress has thrown all concern for U.S. computer vendors — and users — to the wind.

'Japan-bashing'

Some members of Congress have even tried to make political hay by taking sledgehammers to Toshiba electronic products in front of television cameras, giving a whole new meaning to the term "Japan-bashing."

In the vitriolic "let's teach these guys a lesson" atmosphere that spawns such outbursts, making rational trade decisions is clearly impossible.

Computer industry spokesmen and trade groups have been given their say before Congress [CW, July 20], but there is little evidence to suggest that they will have much impact.

Obviously, some punitive action must be taken. And a strong U.S. push for stricter enforcement procedures by the Coordi-

Continued on page 74

More report quarterly upswing

Wang raises eyebrows with strong results; beat goes on for Amdahl, Apollo

BY ADAM STONE
CW STAFF

Most computer systems vendors continued to report strong second-quarter financial results last week, sparking renewed optimism that the industry has left its downturn days behind.

While Amdahl Corp., Apollo Computer, Inc., Prime Computer, Inc. and Software Publishing Corp. continued their current recoveries, Wang Laboratories, Inc. surprised the industry with its most profitable quarter in 2½ years. But some vendors, including Stratus Computer, Inc. and Electronic Data Systems Corp. (EDS), reported earnings increases far lower than their accustomed growth rates.

Just the facts

For complete earnings chart, see page 75.

In addition, significantly lower profits at Maxtor Corp. and Tandon Corp. demonstrated the current upheaval in the microcomputer peripherals industry.

Wang. The Lowell, Mass.-based minicomputer and office systems maker exceeded industry expectations with a $32 million profit, raising hopes that it can sustain a long-awaited recovery.

For its fourth fiscal quarter ended June 30, Wang reported revenue of $824 million, up 15% from the $716.8 million reported in the like quarter of 1986. Profits grew to $32 million, or 20 cents per share, up dramatically from the $800,000, or 1 cent per share, earnings report-

Continued on page 73

CUSTOM-CHIP FORECAST

ASICs: An industry savior?

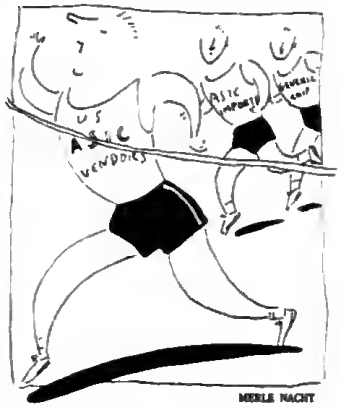
BY LAWRENCE STEVENS
SPECIAL TO CW

The U.S. semiconductor industry suffered the worst slump in its history in 1985 and part of 1986. But sales this year are expected to jump by 20%, according to market research firm Dataquest, Inc. Credit for this short-term recovery, industry observers say, must go in part to application-specific integrated circuits (ASIC), or custom chips.

At Motorola, Inc., for example, while the rest of the chip industry was floundering, ASIC production continued to grow. One reason, claims John Carey, merchandising manager for ASIC design, is that the ASIC market is less susceptible to business cycles.

"ASICs are produced for one particular

Continued on page 72



Intel keeps 80386 in the family

BY JAMES A. MARTIN
CW STAFF

SANTA CLARA, Calif. — After two years spent in the semiconductor industry doldrums, Intel Corp. has hit the jackpot with the 80386 microprocessor. But unlike in the heyday of earlier microprocessor generations, Intel is jealously guarding its new treasure.

Foundry relationships, or second-source agreements, are not in the plans for the 386, as they were for the firm's preceding 8088, 8086 and 80286. Intel said it intends to be the sole source of the technology with a total of four 386-dedicated manufacturing sites, the latest of which is a 600,000-sq-ft plant in New Mexico. Intel also recently said it will terminate a 1982 technology exchange agreement with Advanced Micro Devices, Inc. (AMD), in which AMD would second-source the 386.

"Why should the queen give away her jewels?" said Jack Beedle, president of In-Stat, Inc., a semiconductor research concern in Scottsdale, Ariz. "In the past, you second-sourced a product and, although you received royalties on it, you also had a lot of competition. The 386 is so critical to Intel, so why give it away?"

National Semiconductor Corp. and Motorola, Inc. have also followed that logic, refusing to second-source their 32-bit microprocessors.

Continued on page 68

Sevin helps Proteon at crossroads

BY PATRICIA KEEFE
CW STAFF

WESTBORO, Mass. — Following the loss of several key executives and the foundering of its marketing plan, Proteon, Inc. recently named prominent venture capital investor L. J. Sevin to the position of acting president.

"My role is to get the company pumped," said Sevin, a principal of Sevin-Rosen Management in Dallas. Sevin has temporarily relocated to Massachusetts while he works with Proteon, a manufacturer of token-ring technology.

Sevin stressed that he is very committed to privately held Proteon, which he said is experiencing healthy sales. He will assist in recruiting a new president and vice-presidents of marketing and sales and will direct strategic planning. He said it is not unusual for an investor to step in like this.

Proteon has experienced some attrition at the management and sales levels in recent months. Although Sevin denied the company has management problems, he did say some personnel had left "by mutual consent." He said he expects to hire a president by October and to ease out of the day-to-day operations by November.

Asked whether he will be redirecting Proteon's product strategy, Sevin said it is not necessary. "The industry is turning

L. J. Sevin

to the token ring, and the world is heading this way," he said.

Sevin's appointment comes at a critical point in Proteon's history, according to John McCarthy of Forrester Research, Inc. in Cambridge, Mass. "They have had a heritage as a laboratory development house and now face the classic problem of how to turn that into a mainstream market focus," McCarthy said. "Their product line is confused — they have a commodity token-ring product at the low end and proprietary technology at the high end."

At the high end, Proteon recently revamped its Pronet-10 10M bit/sec. local-area network with the introduction of network management and IBM Micro Channel-compatible adapter cards. And a Proteon reseller said that the company plans to migrate its Pronet-80 80M bit/sec. token-ring network to a 100M bit/sec. version.

Beyond that, Sevin and Chair-

Continued on page 74

Intel

FROM PAGE 67

The success of the 80386 chip has once again made Intel a vital chip manufacturer. Intel has spent more than $100 million in the 386's four-year development effort, has shipped some 65,000 units in 1986 and expects to ship between 500,000 and one million this year, according to Dana Krelle, Intel's 80386 marketing manager.

The 386 is already considered the newest standard in microprocessors and is emerging as the foundation of choice for high-end microcomputers, minicomputers and workstations.

But Intel's sole-source 386 philosophy may be a double-edged sword. Krelle acknowledged that Intel will be "delinquent" in 386 deliveries for the rest of the year but predicted that the firm will meet demand in 1988.

Demand exceeding supply

"Demand is far exceeding supply because a lot of OEMs saw how successful Compaq Computer Corp. has been with its 386 machine," Krelle said. "We're putting on additional manufacturing capacity as fast as we can, but we can't turn on a dime."

In addition, Intel has reportedly been receiving cancellations on several products, including the 286, according to Michael Murphy, publisher of the "California Technology Stock Letter."

Because there are not enough 386 chips to meet current demand, an unexpected number of orders for Intel's related chips, such as math coprocessors and dynamic random-access memory chips, have been canceled in the past few months, Murphy said.

Krelle, however, disputed Murphy's assertion. "We're seeing record demands for the 286. We're shipping more than $1 million per quarter, which is more than double what we were shipping last year. There has been no decline in 386-related orders."

Murphy pointed to the Semiconductor Industry Association's recent book-to-bill ratios for June as evidence that orders have dropped.

The association reported that shipments, or billings, were 18.2% higher than the previous month, but average monthly orders for the three-month period ending in June were down 4.2%, a figure that Murphy said was unusual for the last month of a summer quarter and can be attributed largely to Intel cancellations.

Forging inroads

But Intel is making strong inroads in diversification beyond the 386, analysts said. The firm recently unveiled a series of real-time operating systems and related products for the 386 environment, expanding that chip's presence beyond microcomputers and workstations. The 82786 graphics coprocessor recently received several enhancements aimed at increasing design flexibility and speed.

In addition, the 8087 math coprocessor "should give Intel a good profit margin because it doesn't have that much competition," said Howard Dicken of DM Data, Inc., a Scottsdale research firm.

Intel is "making a real concerted move to get into the systems business," said Kimball Brown, an analyst with Dataquest, Inc. in San Jose, Calif. "They've been successful in selling to technical customers, and now they're working on selling systems directly to users."

Intel already has its eye on the future. The 80486 chip will reportedly feature a 32-bit data bus with some one million transistors, compared with the 286's 135,000 and the 386's 250,000 transistors. The 80486 is not expected to be completed until 1990.

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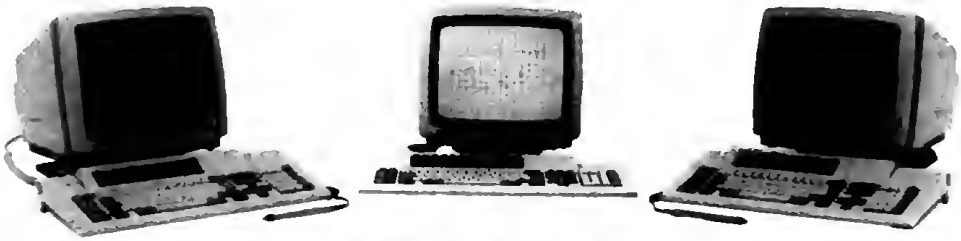

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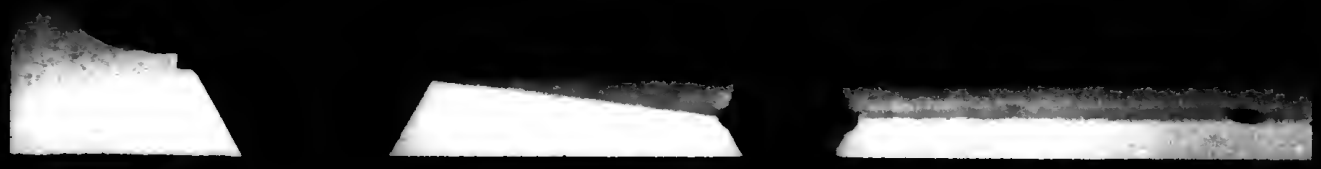

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Hayes

ASICs

FROM PAGE 67

chent, they have to be planned for in advance, and it is not easy to stop production," Csrey says. "They are like an aircraft carrier — they can't zigzag all over the place like a PT boat."

On the rise

According to Andrew Prophet, a senior industry analyst at Dataquest, ASICs will represent 28% of all U.S. computer industry chip consumption this year, and that figure is expected to grow to around 35% by 1990.

But even though the market is now healthy, experts wonder whether ASICs will really be a vehicle for sustained growth or just a flash in the pan. While Carey says that ASICs will become an increasing part of Motorola's sales, he is not blindly optimistic about the product's long-term market potential.

Carey says that as the technology matures, many of the same problems — of marketing and tight competition — that affect other types of chips will eventually affect ASICs as well. Motorola had 5% of the general ASIC market and 18% of the high-end ASIC market in 1986, according to Dataquest.

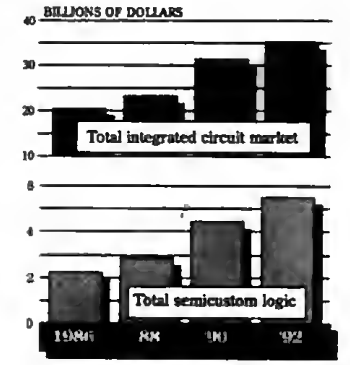
Don't look back

"Motorola may have somewhat of a lead in the market now because of its technology and the relationships it has been able to build with its customers," claims Carey, "but that doesn't mean we can stop looking over our shoulders."

One newcomer to the ASIC field is Intel Corp. According to Robert Elfant, Intel's general manager for cellular products, the ASIC market can support still more companies. "There aren't a lot of standards in the ASIC industry," Elfant says.

"There isn't a common design methodology, a common naming nomenclature, a common packaging configuration or a common testing methodology," he continues. These are all conditions, Elfant claims, that companies find attractive.

World semicustom digital integrated circuits



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On the other hand, Bill Groves, vice-president of technology at research and consulting group In-Stat, Inc., sees ASICs as "the wave of the future," and claims that no major semiconductor company can avoid them and remain in business. Groves adds that he does not see ASICs as a magic carpet that will keep the integrated circuit industry afloat.

Groves says, "There is no reason to believe that ASICs will not eventually become almost as much of a commodity item as noncustom chips have. And if that happens, all the same problems — of diminished profits and foreign dumping — that plague the noncustom section of the industry will affect the custom section." Dataquest's Prophet adds that the low-end gate array business has already become commodity-oriented.

He sees that as a portent for the industry as a whole, and says, "On gate arrays with fewer than 3,000 gates, the cost per gate has dropped dramatically over the last year and a half, from about one cent per gate to around two-tenths of a cent now. It's already at the point where it is hard to make a profit in this low-end business."

Although U.S. companies still dominate the higher end ASIC market, the Japanese have an edge on gate arrays with lower gate counts, and some observers say the Japanese are working their way up.

Land of rising chip?

According to a recent *Wall Street Journal* survey of industry watchers, the Japanese now hold a 40% share of the worldwide $4.5 billion ASIC market, which includes both gate arrays and standard cell-design chips.

This can be compared with their 46% share in the general chip market worldwide. But in the gate array business alone, their share has jumped from 9.5% in 1980 to 33% now.

Andrew S. Rappaport, an industry analyst at Technology Research Group says, "There just isn't anything fundamental about ASICs that will keep the Japanese out of that market."

In fact, because the largest number of ASICs sold are those with smaller gate counts, the top company, according to Dataquest, is Fujitsu Ltd. with sales of $359.2 million; followed by LSI Logic Corp., $194.3 million; AT&T, $183.1 million; and NEC Corp., $151.2 million.

But even those who hold that at least some part of the ASIC business will remain a specialty, rather than a commodity, market, say they do not believe that this technology alone will provide much advantage to U.S. companies vis-a-vis Japanese competitors.

'Rude awakenings'

According to Rappaport, "This whole situation has been wrought with rude awakenings. First, people thought the Japanese didn't want this specialized business. Then we all discovered they did. Then the theory held that they would not be able to turn prototypes around fast enough. But they can get a prototype over from Japan as fast as we can get one out of Texas or California."

In addition, Rappaport says, conventional wisdom holds that ASIC was a software-oriented business, and the Japanese did not have the software to do the job. This was also incorrect, because they could buy the software if they didn't have it. Fears that the Japanese will eventually dominate the market have led some U.S. corporations to ask the government for help.

Recently, LSI Logic, National Semiconductor Corp., Advanced Micro Devices, Inc. and Intel wrote a joint letter to U.S. trade representative Clayton Yeutter, asking that ASICs be included in the U.S.-Japan trade agreement now being negotiated.

Teamwork

But Rappaport says he believes that the best hope for American companies is to use ASICs as a reason to tighten the bonds between chip maker and customer. A prime example of this is the agreement negotiated between Intel and IBM late last year.

In this agreement, IBM will provide Intel with a library of its most important chip designs as well as computer-aided design technology and production techniques, which are used by IBM to produce its own chips. In return, Intel will supply IBM with customized, proprietary chips. IBM is expected to use these ASICs to create more clone-resistant computers.

Other companies following similar paths include National Semiconductor in collaboration with Xerox Corp. and Motorola with Northern Telecom, Inc.

Running in pacts

Pacts such as these between U.S. companies might be more feasible now that the smaller number of component parts in ASICs make going overseas for inexpensive production less attractive. If you boil down a computer system components list from three or four boards and about 300 integrated circuits to an 8- by 11-inch card with three or four very large-scale integration chips that can be surface mounted, Groves says, you've lost your incentive to go overseas.

But others worry that the Japanese might be better at cementing vendor/customer relationships than U.S. firms.

Rappaport says, "The Japanese 'just-in-time' methodology has created a way of doing business that says, 'I want to be your friend. Let's explore the ways that we can work with each other.' It remains to be seen whether U.S. companies can attain that same level of cooperation."

Closing gap

At present, Japanese chip makers by and large have not been able to develop close ties with

"THERE ISN'T anything fundamental about ASICs that will keep the Japanese out. . . . They can get a prototype over as fast as we can get one out of Texas or California."

ANDREW S. RAPPAPORT
TECHNOLOGY RESEARCH GROUP

U.S. customers, but there are signs that they might be trying to create them.

For example, Ricoh Co. recently opened a semiconductor design center in San Jose, Calif., to develop custom ASICs for U.S. and Canadian customers.

While the initial project only houses a modest staff of 30, Ricoh has plans to increase the staff to 150 within five years.

Nevertheless, U.S. companies are still strong in the ASIC marketplace and they are expected to remain so, at least for the short range. The question is whether they can maintain their lead into the '90s.

"There is no question that foreign companies are able to mass produce high-quality products at lower cost than U.S. firms. Instead, U.S. companies have to ask their customers, 'What kind of complex functions can we provide you? Help us to imbed that knowledge into the systems we create for you.' That is the best — and probably the only — way to create substantial barriers to foreign competition," Rappaport concludes.

Stevens is a free-lance writer based in Springfield, Mass.

A choice of two technologies

There are two basic categories of application-specific integrated circuits (ASIC): gate arrays and standard cell designs. Gate arrays are like building blocks in which the logic gates are mass produced in silicon, and the user specifies how those building blocks should be pieced together. Standard cell-design chips are custom chips with functions specified by the customer. These functions are incorporated into a very large-scale integration chip.

In a very general sense, a gate array can be compared with a modular house in which the purchaser chooses from among a number of limited options such as a finished or an unfinished attic, the style of flooring and siding material.

Standard cell design, on the other hand, is akin to having an architect design the house from scratch.

ASIC technology allows manufacturers to customize their integrated circuits for their clients. There are two main advantages of ASICs over noncustom chips. The first is that because they are customized, they ensure that a smaller component package is needed. Since manufacturers need fewer components to meet specifications, the product is less expensive to produce.

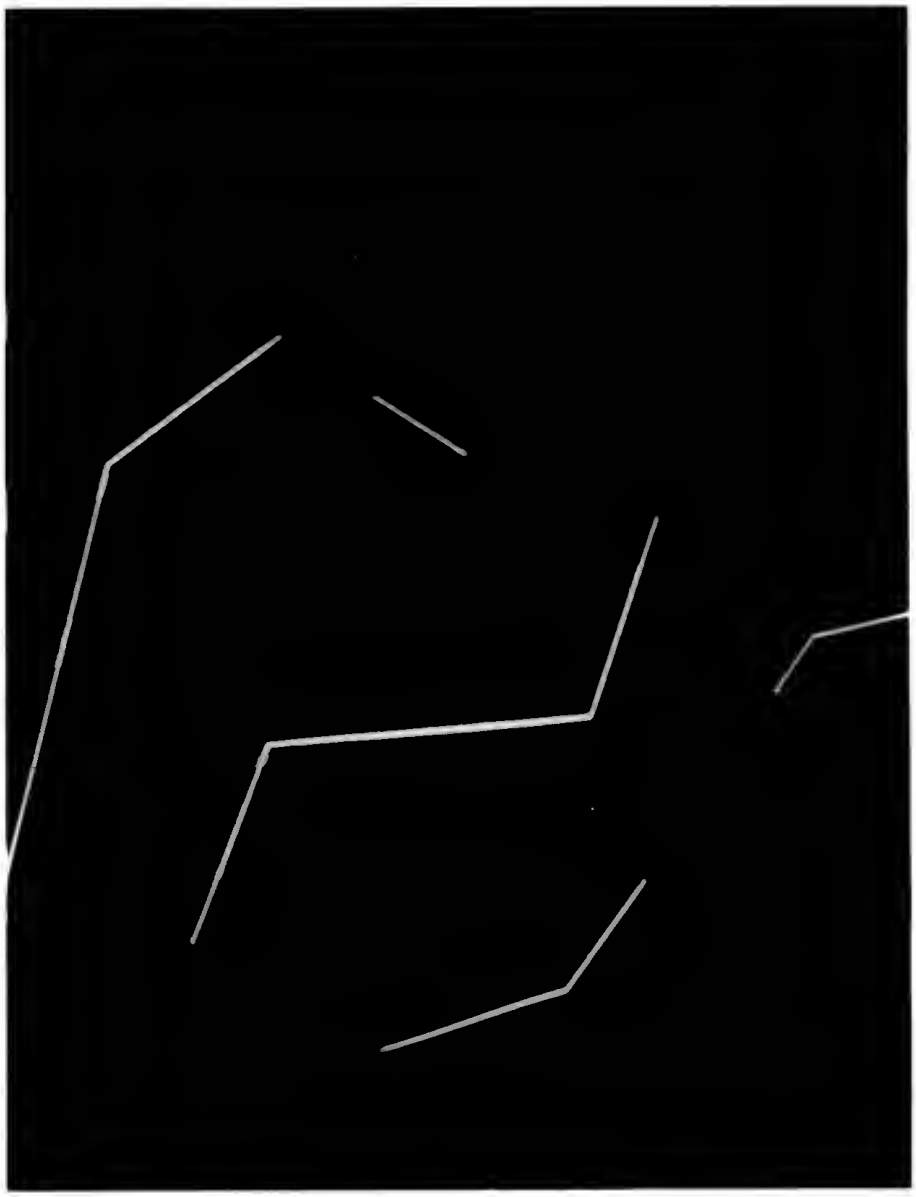
Secondly, the chips can be designed with proprietary information. This makes it more difficult for computer manufacturers to clone a competitor's product, since it does not use standard chips.

LAWRENCE STEVENS

COMPUTERWORLD

SPOTLIGHT

GRAPHICS WORKSTATIONS AND SOFTWARE



Elements are rapidly changing and combining in computer-aided design and drafting, and the resulting mixture could easily set off a complete restructuring of the work process for those who depend on these specialized hardware and software platforms.

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As workstations and PCs tangle at the low end of the technical design market, vendors are seeking separation on higher ground.

CLASH PROVOKES BURST OF CHANGE

BY ALAN PALLER

STEVE DINDINO

A battle is taking shape in the low-cost technical and graphics workstation markets. The dynamic young workstation vendors, Apollo Computer, Inc. and Sun Microsystems, Inc., are being jostled and shoved by new announcements from IBM, Digital Equipment Corp. and Apple Computer, Inc. But they're fighting back.

Users see the impact of the new developments in two ways: Workstation price/performance is improving at an extraordinary rate, and choosing among products is getting tougher.

In the distant past — before 1987 — personal computers were different from workstations. PCs, which included IBM compatibles and Apple Macintoshes, were used by the masses for word processing and spreadsheet and management graphics applications. Workstations, on the other hand, were desktop computers used by the technical elite for "real work" like seismic analysis, three-dimensional modeling, technical documentation and stock market analysis.

In those days, technical professionals had good reason to shun PCs in favor of workstations. PC screens were too small. PC graphics resolution was too low. Graphics screen updating was too slow and too computer intensive. PCs could not support more than one task at a time. PC operating systems limited the size of programs that could be run. And PCs had processors that choked on computation-intensive jobs. These weaknesses were used to justify the workstations' $20,000 or more price tags.

But just as 8-bit computers turned into more powerful and capable 16-bit computers, so are PCs turning into more capable workstations. IBM's Personal System/2 Model 80, based on the Intel Corp. 80388 chip, and Apple's Macintosh II, based on the Motorola, Inc. 68020 chip, were both announced during the past year.

With these and related announcements, each of the following historical differences between PCs and workstations is fading or soon will fade away:

- **PC screen size.** Less than $1,000 will now buy a 19-in. high-resolution (80 to 100 dot/in.) monochromatic monitor.
- **PC screen resolution and speed.** Color resolution of 480 by 640 pixels is now standard, and 1,000- by 1,280-pixel boards are as common as high-capacity disk drives. The new graphics boards have independent processors that provide rapid screen updating without loading the PC processor.
- **PC multitasking.** A new version of Microsoft Corp.'s MS-DOS — OS/2 Extended Edition — is scheduled to provide multitasking by early 1988. In the meantime, most users will allow windowing technology to suffice as simulated multitasking.
- **PC memory limits.** PC memory boards of 2M and 3M bytes are now widely available. Upgraded operating systems (such as IBM's and Microsoft's OS/2s) will make that extra memory available to programs within a year.
- **PC processor power.** Intel 80386-based computers, at 16 and 20 MHz, are processors as powerful as the CPUs in most of the workstations currently on the desks of technical professionals. The Mac II processor is identical to the processors of the low-end workstations from Apollo,

Paller is president of AUI Data Graphics, a division of Computer Associates International, Inc., and director of training for the National Computer Graphics Association.

Cost comparison

PCs vs. graphics workstations

Company	Product	Basic diskless	Basic monochrome	Intermediate color	Higher color
IBM	PS/2 Model 80	Not available	Price: $7,379; 16-MHz 80386 processor; 1M-byte RAM; 1.44M-byte floppy disk; 44M-byte hard disk; OS/2; VGA; 16 in. monochrome display; keyboard	Price: $9,009; 16-MHz 80386 processor; 80387 coprocessor; 1M-byte RAM; 1.44M-byte floppy disk; 44M-byte hard disk; 16 color, 480 by 640 VGA; 13 in. color display; audio; mouse; keyboard	Price: $13,[illegible]; 20-MHz 80386 processor; 80387 coprocessor; 4M-byte RAM; 1.44M-byte floppy disk; 115M-byte hard disk; 13 in., 480 by 640 color display; audio; mouse; keyboard
Apple	Mac II	Price: $4,397; 16-MHz 68020 processor; 1M-byte RAM; 13 in. monochrome, 480 by 640 display; audio; mouse; keyboard	Price: $6,897; 16-MHz 68020 processor; 1M-byte RAM; 800K-byte floppy disk; 40M-byte hard disk; 13 in. monochrome, 480 by 640 display; audio; mouse; keyboard	Price: $7,644; 16-MHz 68020 processor; 68881 coprocessor; 68851 Page Memory Management Unit; 1M-byte RAM; 800K-byte floppy disk; 40M-byte hard disk; 256 color, 13 in., 480 by 640 display; audio; mouse; keyboard	Price: $10,141; 16-MHz 68020 processor; 68881 coprocessor; 68851 Page Memory Management Unit; 4M-byte RAM; 800K-byte floppy disk; 80M-byte hard disk; 256 color, 13 in., 480 by 640 display; audio; mouse; keyboard
DEC	Vaxstation 2000	Price: $4,600; 20-MHz processor, floating-point coprocessor; 4M-byte RAM; 15 in. monochrome, 1,024 by 864 display; mouse; keyboard	Price: $7,600; 20-MHz processor, floating-point coprocessor; 4M-byte RAM; 1.2M-byte floppy disk; 42M-byte hard disk; 15 in. monochrome, 1,024 by 864 display; mouse; keyboard	Price: $10,900; 20-MHz processor, floating-point coprocessor; 4M-byte RAM; 1.2M-byte floppy disk; 42M-byte hard disk; 15 in., 16 color, 1,024 by 864 display; mouse; keyboard	Price: $17,400; 20-MHz processor, floating-point coprocessor; 4M-byte RAM; 1.2M-byte floppy disk; 115M-byte hard disk; 16 in., 16 color, 1,024 by 864 display; mouse; keyboard
Apollo	Dominie 3000	Price: $4,990; 12-MHz 68030 processor; 68881 coprocessor; 68851 Page Memory Management Unit; 4M-byte RAM; 1,024 by 800, 15 in. monochrome display; mouse; keyboard	Price: $6,990; 12-MHz 68030 processor; 68881 coprocessor; 4M-byte RAM; 1.2M-byte floppy disk; 72M-byte hard disk; 1,024 by 800, 15 in. monochrome display; mouse; keyboard	Price: $13,900; 12-MHz 68030 processor; 68881 coprocessor; 4M-byte RAM; 1.2M-byte floppy disk; 72M-byte hard disk; 16 color, 1,024 by 800, 19 in. display; mouse; keyboard	Price: $14,900; 12-MHz 68030 processor; 68881 coprocessor; 4M-byte RAM; 1.2M-byte floppy disk; 158M-byte hard disk; 16 color, 1,024 by 800, 19 in. display; mouse; keyboard
Sun	Sun Model 3/50 (monochrome) and 3/110 (color)	Price: $4,995; 16-MHz 68020 processor; 4M-byte RAM; 1,152 by 900, 19 in. monochrome display; mouse; keyboard	Price: $9,945; 16-MHz 68020 processor; 4M-byte RAM; ¼-in. tape; 71M-byte hard disk; 1,152 by 900, 19 in. monochrome display; mouse; keyboard	Price: $21,995; 16-MHz 68020 processor; 68881 coprocessor; 4M-byte RAM; ¼-in. tape; 71M-byte hard disk; 1,152 by 900, 256 color, 19 in. display; mouse; keyboard	Sun intermediate color
HP	HP 9000 Model 319M (monochrome) and 330C (color)	Price: $7,800; 16-MHz 68030 processor; 68881 coprocessor; 4M-byte RAM; 1,024 by 768, 17 in. monochrome monitor; mouse; keyboard	Price: $10,800; 16-MHz 68030 processor; 68881 coprocessor; 4M-byte RAM; 800K-byte floppy disk; 200M-byte hard disk; 1,024 by 768, 17 in. monochrome monitor; mouse; keyboard	Price: $21,300; 16-MHz 68030 processor; 68881 coprocessor; 4M-byte RAM; 800K-byte floppy disk; 200M-byte hard disk; 64 color, 1,024 by 768, 19 in. monitor; mouse; keyboard	Price: $34,150; 16-MHz 68030 processor; 68881 coprocessor; 4M-byte RAM; ¼-in. tape; 800M-byte hard disk; 64 color, 1,024 by 768, 19 in. monitor; mouse; keyboard

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Clash

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Sun and Hewlett-Packard Co.

The net result of all these changes is that a 1987 PC system, either IBM's PS/2 Model 80 or Apple's Mac II, now offers most of the basic computing capabilities offered by the workstations of 1986. And these PC systems cost half as much as the earlier workstations.

However, equal processing power and graphics do not make two systems equal. Networking, software availability, standards, reliability and ease of use all play important roles in determining user satisfaction and, at least in terms of perception, the workstation vendors currently have an edge in these areas.

No one knows how long this advantage will persist, though, and the question is whether these companies can add enough new and important functionality to maintain differentiation in users' minds and to support the substantial price differential between workstations and PCs on an ongoing basis. If not, will vendors have to cut their prices and try to reposition themselves as higher volume producers?

Power and speed

Accurate answers to these questions are being sought by the decision makers in many companies considering large-scale acquisition of computers for their technical staffs. No company wants to acquire a workstation only to learn a few weeks later that the price of that machine has dropped by 30% or 50% or that a new model with twice the power is available at the price the company has already paid.

Chief among the forces shaping the workstation market is the demand for power. The old adage that users will fill all available computer memory and processing power is just as true for desktop computers as it was for mainframes. Additional memory, faster processors and bit-mapped high-resolution graphics are being snapped up and used by power-hungry technical professionals. Evidence of this can be found in the speed with which IBM Personal Computer AT users are shifting to Intel Corp. 80386-based computers, which are approximately 250% faster.

Most users are using the extra power simply to speed recalculations of large spreadsheets and layout of large documents. Software of the future, such as context-sensitive grammar checkers and text-based retrieval systems, will make even 386-based machines seem slow. So the demand for more powerful computers is large and growing.

Competition and manufacturing economics are also playing a major role.

While the demand for more power grows, the economics of desktop computer sales is pushing all U.S. desktop computer vendors toward more powerful machines. Korean and Taiwanese PC clones have made the low end of the market too competitive for most U.S. vendors. It costs a vendor only a few hundred dollars more to build a 386-based computer than to build an AT, and it can sell the more powerful machine for $1,000 to $3,000 more.

In addition, more powerful PCs and workstations are usually accompanied by networks containing disk and print servers that cost $20,000 to $100,000 each. Workstation vendors make the majority of their profits selling these servers and upgrading the disks and graphics boards of the workstations.

IBM, Compaq Computer Corp. and Apple, the three principal PC manufacturers in the U.S., are being pushed into the high end of the desktop market by pressure from below and pulled by profit margins available at the top.

A third major force acting on the desktop computing industry is the new demand for networking. Users are tired of relying on "Sneaker Net" (the facetious name given to the practice of donning sneakers and carrying floppy disks from one place to another). Technical staffs are demanding that pictures and words created at one workstation be freely available for review and editing at every other workstation and even on the minicomputers and mainframes in their organizations.

> CHIEF AMONG THE forces shaping the workstation market is the demand for power. The old adage that users will fill all available computer memory and processing power is just as true for desktop computers as it was for mainframes.

The last major force is an overwhelming plea for standards from large users. They want standard operating systems so they can move applications freely from one computer to another. They want standard user interfaces so they can reduce their training costs. They want standard graphics storage formats so they can transfer pictures from one machine to another. And they want standard network protocols so they can shift documents, graphics and entire jobs to wherever they are needed.

What users really want

Ask 10 users what they want in workstations, and you will get 10 different answers. Some focus on processing power, some on graphics screen size and resolution. Others talk about networking; still others ask for MS-DOS compatibility.

A comprehensive definition of user requirements can best be found by looking over the shoulders of the people preparing specifications for two of the largest workstation procurement projects currently under way: the U.S. Navy procurement and the General Motors Corp./Electronic Data Systems Corp. (EDS) specification. Each of these projects will ultimately lead to the acquisition of more than 10,000 technical workstations.

The Navy has defined the workstations that its engineers will need during the next few years in its 1,300 page "Navy CAD/CAM 2nd Acquisition Request for Information Closure Document" for technical workstations. A team of technology and requirements experts spent more than a year interviewing vendors and users to learn how far they could push the state of the art.

Several aspects of the Navy's Request for Information (RFI) document will make its contribution significant, including the addition of office automation, addition in graphics processors and definitions of levels of demand.

It provides for three tiers of workstations: one for drafting and management, another for design and numerical control programming and a third for heavy analysis in fluid dynamics and structural analysis. In defining workstations that will serve each group, the Navy has redefined the level of computing power that will be expected from workstations.

This RFI is also significant because of the volume of tools the Navy is planning to purchase. An order for thousands of workstations will mean very low prices, perhaps less than $2,000 for the 1- to 2-million instructions per second (MIPS) machines and less than $5,000 for the 4- to 5-MIPS processors. Nearly every other large buyer of workstations is monitoring the progress of the Navy procurement, confident that what the Navy buys will be available to other large purchasers at similarly advantageous prices.

The Navy specified processors ranging from 1 to 2 MIPS for drafting and management, 4 to 5 MIPS for designing and 8 to 10 MIPS for analysis. A 10-MIPS workstation is equivalent to the processing power of 10 DEC VAX-11/780 computers in a single workstation. Only five years ago, a VAX-11/780 was expected to be able to serve the needs of 20 to 40 users simultaneously.

The Navy's mix-and-match approach and high expectations in terms of mass storage and graphics processors will also force vendors to offer a comprehensive line of workstations rather than islands of capability.

For example, the RFI calls for graphics processors of two

Continued on next page

Capability comparison

PCs vs. graphics workstations

	IBM: PS/2 Model 80	Apple: MAC II	DEC: Vaxstation 3000	Apollo: Domain Series 3000	Sun: Sun 3/50 (monochrome) and Sun 3/110 (color)	HP: HP 9000 Model 318M (monochrome) and Model 330C (color)
Primary operating system	OS/2 (available in first quarter of 1988)	Macintosh/OS	VMS	Domain/IX (University of California at Berkeley's Unix 4.3 and AT&T's Unix System V)	Unix	HP-UX (Unix System V plus extensions)
Multitasking	First half of 1988	Late 1988	Yes	Yes	Yes	Yes
Windows	First half of 1988	Yes	VMS Windows	Yes	Yes	Yes
Maximum virtual memory	1G byte (OS/2)	Real memory up to 1.5G bytes	4G bytes	64M bytes	256M bytes	4G bytes
MS-DOS capabilities	Yes	Optional coprocessor	Optional network server	Yes, in software emulation	Optional coprocessor or network server	Optional coprocessor
Number of programs available for primary environment	20,000	2,500	3,500	1,700 in catalog, plus Unix	900 in catalog, plus Unix	1,116 in catalog, plus Unix
Other operating systems	Unix	A/UX with 68851 PMMU[1]	Ultrix	None	None	Rocky Mountain Basic OS and Pascal OS
Processor	Intel 80386 16 and 20 MHz	68020 16.7 MHz	78032 20 MHz	68020 12 MHz	68030 16.7 MHz	68030 16.7 MHz
Floating-point coprocessor	Intel 80387 (optional)	Motorola 68881 (standard)	DEC 78032 (standard)	68881 (standard)	68881 (optional)	68881 (standard)
Internal memory (standard/maximum)	1M or 2M/16M	1M/1.5G	4M/6M	2M/8M	4M/4M (Model 3/50) or 12M (Model 3/110)	4M/4M (Model 318) or 8M (Model 330)
Color and resolution	640 by 480, 16 colors; or 320 by 200, 256 colors	640 by 480, 256 colors	1,024 by 864, 16 colors	1,024 by 800, 16 colors, option for 256 colors	1,152 by 900, 256 colors	1,024 by 768, 64 colors
Floppy disks	1.4M, 3½ in.	800K, 3½ in.	1.2M, 5¼ in.	1.2M, 5¼ in.	None	800K, 3½ in.
Hard disks (capacity/access time)	44M/40 msec, 70M/30 msec, 115M/28 msec	20M/30 msec, 40M/30 msec, 80M/30 msec	42M/48.3 msec, 71M/30 msec, 159M/30 msec	72M to 348M/all 20 msec	70M/30 msec, 141M/23 msec	10M/75 msec, 20M/75 msec, 40M/48 msec, 82M/36 msec, 131M/36 msec, 308M/36 msec, 571M/36 msec
Internal drive slots	Two floppy, two hard	Two floppy, one hard	Two floppy or one floppy and one 44M-byte hard	One floppy and one hard	All drives external	All drives external
I/O ports	Serial, parallel, mouse	SCSI, dual serial, mouse, Appletalk, four-voice audio	Two serial, one Vaxcluster (Ethernet)	One serial and one network (Ethernet or token ring)	Two serial, one Ethernet	One IEEE 488 parallel, one proprietary serial, one serial, one Ethernet (and IEEE 802.3)
Expansion slots	Four 16 bit, three 32 bit	Six Nubus (8, 16 or 32 bit)	None	Seven 16 bit (PC AT), one 8 bit (PC XT)	None on Model 3/50, VMEbus on Model 3/110	None on Model 318M, VMEbus on Model 330C
Floor or desktop	Floor	Floor	Desktop	Desktop	Desktop	Desktop
Maintenance costs (per month for next day on-site service for diskless system)	Not available	Not available	$45	$73	$49	$18

[1] Page Memory Management Unit
[2] Small computer systems interface

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types: Type 1 requires 16 simultaneous colors, 100,000 two-dimensional vectors displayed per second and 15 million pixels filled per second. Type 2 requires 4,096 simultaneous colors, 200,000 2-D vectors per second, 150,000 3-D vectors per second and 100 million pixels filled per second. In the mass storage area, the Navy RFI calls for 100M-byte, 600M-byte and 1G-byte disks.

A strong requirement for standard office automation facilities will allow engineers to have one workstation on their desk and an easy means of putting graphics into documents.

A full chapter of the Navy RFI spells out requirements for an office toolbox that includes word processing, spreadsheet, business graphics, data base, project management and electronic mail.

The GM/EDS project differs from the Navy's because it lays out the specifications without guaranteeing to buy a fixed quantity. On the other hand, if workstation vendors want to sell to GM/EDS, they will have to meet its specifications.

The most notable segment of the GM/EDS specification is that it is trying to establish a fixed user interface "look and feel" that will be the same on every application and on every workstation, regardless of the vendor that supplies the workstation or application.

In this quest, EDS is following in the footsteps of Apple's Macintosh computer, which proved that ease-of-use was optimized when users did not have to learn new interfaces as they moved from application to application.

Ease of use is one of two user requirements that EDS discovered in extensive research on what happens after workstations are installed. The EDS researchers found that few workstation buyers focused on ease of use when purchasing their workstations, probably because they believed that ease of use was automatic when windows were available in the operating system.

However, when those users tried to switch from application to application, they found that software developers had defined keys and menu items so differently that learning was difficult.

EDS research findings on ease of use are echoed by Neil Kleinman, president of Pacific Technology Associates in Tarzana, Calif. Kleinman is one of a small number of consultants often retained by workstation vendors to help define user interfaces and the right mix of graphics and processing power.

Kleinman clarifies the ease-of-use requirement in a useful way. In his opinion, there are three types of workstation users: users who do many applications, such as publications, drafting, word processing and charting on a single workstation; users who dedicate their workstation to a single application requiring significant processing; and those in the middle.

The common user interface, such as the one EDS is attempting to build, is essential, according to Kleinman, but only for the first class of users. It is unnecessary for those working in dedicated situations because a single-application workstation has only one interface for the user to learn.

> MOST WORKSTATION buyers are not new to computing. They are already using computers for important applications and are looking for better solutions.

A second, unexpected user need was uncovered in EDS's research when users bought more than a few workstations. According to EDS project leader Dan Shubert, maintainability is often overlooked by new workstation buyers.

Maintainability has two dimensions: software and hardware. Software maintainability means distributing software updates on each workstation, managing the network files and performing other tasks required when software is distributed to remote locations. Hardware maintainability simply means making sure the machines do not break or are fixed quickly when they do.

Shubert says younger workstation vendors, like Apollo and Sun, have a lot to learn about in the areas of reliability and maintainability, although they have made great strides.

A buyer can measure a product's reliability, Shubert suggests, by comparing monthly maintenance charges with workstation prices. As the comparison table shows (see table above), there are major differences in the costs of maintenance charged by the vendors.

Familiarity

Most workstation buyers are not new to computing. They are already using computers for important applications and are looking for better solutions to their needs. In fact, their principal justification for acquiring workstations is to improve productivity by off-loading tasks from mainframes. These kinds of buyers reason that moving to workstations changes variable costs to fixed costs and improves system responsiveness.

A telling example of this requirement is found in the engineering department of a multibillion dollar company that acquired 10 Apollo workstations approximately one year ago. When asked why it chose Apollo, the company's systems manager said Apollo was the only workstation the firm could find that ran the five programs its engineers depended on to get their design and analysis work done. Those programs are MSC/Nastran from MacNeal-Schwendler Corp. and Patran from PDA Engineering, Inc. (for finite element analysis) and three Computer Associates International, Inc. products — Tell-A-Graf and Dissplà (for graphics) and Tell-A-Plan (for project management).

All five programs ran successfully on the IBM computer the engineers used. The company reasoned that if it bought workstations that ran all five, the engineers would not have to learn new software or translate their projects to new software.

Since that time, Sun, DEC and HP have made the same five software packages available on their workstations so they would not be at a disadvantage when competing to sell to users of those packages.

The newest user requirement, and currently the hottest area of contention among vendors, is the demand for work

Continued on page S6

Take the measure of drafting software

BY JOEL ORR

A functional system specification, based on the needs of your applications, will help you determine which computer-aided design and drafting (CADD) systems have what it takes to meet your needs. However, there are several other important considerations that can help you narrow the field.

Is there a system that is used by most of the practitioners in your field? For example, most moldmakers use McDonnell Douglas Manufacturing System's Unigraphics; most state departments of transportation use Intergraph Corp.'s IGDS. Do not, however, select or reject a system for its popularity among your colleagues; be sure you understand whether that popularity is the result of superior performance or just superior selling.

Scientific tests indicate all of the common input devices, including digitizing pucks, joysticks, trackballs and other non-pen-like units, rate as equivalent in terms of ease of learning and ease of use. Oddly enough, however, feelings run strong in this area and prejudice abounds. The majority of engineering professionals, for instance, seem to prefer an input device that looks and feels like a pencil or a pen. Such preference for the familiar is understandable but could overshadow the superior suitability of a product with a different input device and should not be incorporated into your decision.

Compatibility problems

Compatibility with other systems within the organization, or with those of clients or vendors, is an important issue. File conversions, even those involving Gerber Systems Technology, Inc.'s Initial Graphics Exchange Specification (IGES), a neutral file standard, are cumbersome and inconvenient.

One major consumer-products manufacturer allowed a division to select and purchase systems independently and is now facing the necessity of investing tens of thousands of dollars in software, development and experimentation in order to move data between Auto-Trol Technology Corp.'s Series 7000 and Unigraphics via IGES.

Although benchmarks are traditionally an important part of the computer selection process, their value for CADD evaluation is questionable. Such timed system performance tests are not easy to design for CADD systems, and they are also expensive and time-consuming for both the prospective user and the vendor. Prospective users seldom understand their own intended use well enough to design a valid benchmark. It is particularly difficult, with interactive systems, to differentiate between the facility of the system operator and the system's capability.

Performance testing

In a benchmark, the motivation for a vendor to make a system appear better than it is cannot be ignored. Even the most honest vendor — and, sad to say, not all are honest — is subject to tremendous pressure to make its particular system look good.

One of the U.S. armed services designed a week-long benchmark for the three candidate vendors that remained at the end of a year-long CADD system selection process. The vendor that ultimately won the contract did not pass the benchmark successfully but promised to remedy its shortcomings.

Two years after the systems were installed, many of the promises are still unfulfilled. But, worse, users, disgusted with the systems, claim the extreme conditions of the benchmark do not reflect production conditions; the systems can do exotic things but do not perform well in day-to-day use.

Performance tests, which simply demonstrate the ability of a system to perform a given set of tasks without timing, serve the intended purpose at less expense. Even these should be applied only to the final one or two candidates. Do not give a completed drawing to vendors and ask them to replicate it; that is not how drafters and designers work. Instead, base the test on conditions similar to those in your engineering area.

The best approach to gauging the quality of a system is through extensive questioning of current users. Speaking to system users and managers, face to face, you can gain an appreciation of what the system is like — not what the vendor promises it will be like "real soon now." Be prepared to spend time — half a day or a day — with each of several users. This is an investment that always pays off. ●

Orr is president of Orr Associates, Inc., a computer-graphics consulting firm based in Great Falls, Va. He is a founder of the National Computer Graphics Association.

Where the boundaries blur

Design will blend with drafting, and raster images will overlay vector data

The challenge of automating engineering drawing has been met. We can draw lines, circles and splines. We can place and edit text and dimensions and otherwise make and modify engineering drawings to our heart's content — three to 10 times faster than we ever could by hand. The next step is to expand the metaphor of the engineering drawing far beyond its original use.

In tomorrow's systems, a further blending of design and drafting is likely to occur. Design and manufacturing considerations will be introduced into the design process by artificial intelligence agents — programs that "observe" the process as it takes place and offer suggestions for improvement.

While many of the more than 200 computer-aided design and drafting (CADD) companies existing today will not make it, others will rise to take their place. However, the new ones will be niche-oriented; rather than offer generic CADD systems, they will introduce systems for the design of a particular range of products.

Such programs will initially be designed for individual application areas. Subsequently, generic versions, designed to be "educated" by the user, will become available. Natural-language interfaces will enhance the interaction.

Eventually, we will probably see products for engine design and products for plastic-mold design, systems for hospital design and systems for mall design.

Speech, sound recognition

These new design systems will accept spoken input from the user. "Make a building," the user will say. "Like this?" the system will ask, displaying a simple structure — or maybe even the Taj Mahal if the system knows the user has a sense of humor and wants to be entertained. It will perceive this willingness to be entertained through the user's degree of voice tension and pattern-matching.

Many of these systems will be seamlessly linked to production systems of various sorts, such as a building system described a couple of years ago by Tim O'Connor, a Detroit engineer: Servo-controlled lasers will be connected to the CADD system and will create points in space for the building crew to use at each stage. Only the location of the lasers will have to be carefully surveyed; the laser pointers will show where everything else is to go.

Real-time 3-D color-animation capabilities will eventually become integral to all systems, even electronic design. In circuit design systems, animation will be used to respond to routing and placement queries and to explain the logic behind the system's particular choices.

Sound annotation of drawings and models will be common, and sound engineering — a technology with both the promise of enhanced communications and the threat of unwitting manipulation — will be developed to the point of being able to induce emotional states in the observer on demand. When this happens, the producer of the drawing will have almost complete control over the communication. For instance, in showing a set of proposal drawings to a prospective client, an architect could use voice annotation to get across the mood of the proposed setting as well as its visual aspect.

Shape recognition will be part of the systems. "Show me all the circular parts," the operator will say, and the system will respond by highlighting the appropriate components.

CADD systems will have a brainstorming mode in which they will generate designs based on a few criteria. The operator will then be able to select the designs to be enhanced.

Cost estimating will be built into many systems, along with sophisticated material selection and optimization routines. The problem with most costing routines today is that the systems do not recognize the same sorts of objects that people do. With appropriate object-recognition software, systems will identify objects, not just pieces of geometry, even when the user has not explicitly named the geometry as objects.

Out of all these features a totally new activity will emerge, one quite different from what is today called drafting or even design. This new activity will take advantage of the resources available in graphics computers for the production of geometry with associated meaning — not just lines, circles, ellipses and splines but walls, chairs, flanges, resistors and roads.

Instead of mere geometric abstraction, the full semantic implications of nouns and verbs will be understood by CADD systems. Thus, the user will be free to address the real issues of design, issues dealing with form and function.

These new systems will serve as true partners and not just mind-amplifiers. Their use will become essential, and should the world last that long, there may come a day when designers cannot conceive of working without them.

The immediate future

But for the present and the immediate future, what will today's CADD systems do in a year or two that they cannot do today? For one thing, they will overflow with context-sensitive help. Manuals will become entirely optional and will be read only by those with an unusual interest in the technical details of the system.

All the leading systems will be ported to Unix and the new DOS; in the latter environment, they will all optionally run under Microsoft Corp. Windows. There will be a number of drawing and configuration-management systems that interact with Sun Microsystems, Inc.'s Network File System, already placed by that firm in the public domain.

Within the next two years, raster data will become much more common in CADD files. Some systems currently support raster images and allow them to be overlaid on the vector information of the CADD system. The new systems will have extensive raster- and vector-editing capabilities without having to switch modes. This will make it easy to incorporate images grabbed from video sources.

The most difficult aspect of CADD software to predict is cost. Already, systems abound that cost less than $500 and do as much as a $3,000 system. Will their progenitors survive and overrun the vendors of larger systems? Or will the more expensive systems vendors find features to offer to justify their higher cost and ultimately outsell the tiny CADD system vendors? It could go either way.

But the greatest change on the horizon for CADD software is in the assumptions about how drafters and designers work. Only when the initial dust cloud has settled will there be an understanding of what CADD software must look like to support the new ways of doing things.

JOEL ORR

NEW DESIGN SYSTEMS will accept spoken input from the user. "Make a building," the user will say. "Like this?" the system will ask, displaying a simple structure — or maybe even the Taj Mahal.

The graphics zone: Workstation exploration in three dimensions

BY VICKI BROWN

Just as the original Apple Computer, Inc. Macintosh changed the world of personal computing with visual icons, so are high-end three-dimensional graphics workstations dramatically altering the design world — giving product designers the artistic tools they need to be more creative, to explore their alternatives and, ultimately, to produce better and more attractive graphics products.

Designers no longer need to draw pictures or construct clay models to visualize their final products. With the help of realistically shaded three-dimensional images on high-performance graphics workstations, artists and designers can generate dozens of new models in mere minutes — compared with the days or weeks required to generate one conventionally produced draft or prototype.

As with any new technology, the first adopters of these high-performance graphics systems were leading-edge automotive and aerospace firms. General Motors Corp. and Chrysler Corp., for instance, use 3-D graphics workstations in some of their styling departments to conceptualize new car shapes, interiors, colors and various feature options.

Powerful possibilities

But good news travels fast, and it did not take long for others to realize the advantages of near-real-time manipulation of computer images.

Kraft, Inc., for example, now uses Mountain View, Calif.-based Silicon Graphics, Inc.'s Iris workstations to design catsup containers that are more attractive and appealing to shoppers. And one leading advertising firm has already begun airing catchy Benson & Hedges cigarette commercials that use advanced animation techniques made possible with today's workstation graphics.

Merely providing workstations with a lot of computing power is not enough to effectively perform animation, wind tunnel simulation, molecular modeling, fluid flow or solid modeling applications.

As Tom Lasinski, workstation subsystem manager of the Numerical Aerodynamic Simulation Program at the National Aeronautics and Space Administration, points out, [Cray Research, Inc.'s] Cray 2 is 500 times more powerful than Iris, but it has no eyes."

It is the eyes — the ability to visually display and manipulate data on the screen — that distinguish 3-D graphics workstations from other systems, including technical workstations. While nearly every computer maker, from Apple and IBM to Apollo Computer, Inc. and Digital Equipment Corp., has entered the low-end (less than $20,000) technical workstation market, only three companies have ventured into the more demanding realm of visual computing.

Today's trio

Even though Apollo, based in Chelmsford, Mass., pioneered the technical workstation market five years ago, it was Silicon Graphics that came to market first with a 3-D graphics workstation.

Since Silicon Graphics' first Iris workstation was shipped in 1985, the company has installed more than 2,000 systems for a wide variety of engineering and scientific applications — from discovering crude oil and developing new pharmaceuticals to building airplanes and bringing motion-picture animations to life.

Last December, Hewlett-Packard Co. became the first company to challenge Silicon Graphics in the highly specialized 3-D graphics workstation arena with its announcement of the 9000 Model 350SRX. Apollo followed on HP's heels five months later with the DN 590 Turbo.

These three pioneer systems share several features, which essentially define the current state of the art. These include the following:

- Twenty-four color bit-planes providing an impressive 16.7 million simultaneous colors.
- A 19-in. color monitor with a minimum of one million pixels, or 1,024- by 1,024-pixel resolution.
- Double buffering and Z-buffering capabilities, enabling faster manipulation of real-time objects.
- At least one specialized graphics processor to assist the main CPU with the thousands of mathematical operations required to move vectors and polygons that represent the desired object.

With the addition of optional 3-D graphics accelerators and floating-point accelerators, workstations from all three of the vendors can manipulate graphics images at the rate of more than 5,000 polygons per second. Such a feat was inconceivable as little as five years ago and is a major step toward achieving the realistic depiction of graphics.

However, there is still a great deal of work to be done.

Even today's top 3-D workstations cannot realistically simulate a human being running in real-time, with on-the-spot calculations. A lifelike image of Michael J. Fox dashing from his apartment for a can of soda, for example, would require millions of polygons — thousands for his face alone.

Further, to approximate the world as our eyes see it, each polygon would have to be smaller than 5 by 5 pixels.

Today's system may not be fast enough to capture the pace of life, but hardware and software barriers are being broken down every day, thanks to ongoing research and development in industry and academia.

New wave of players

While Apollo, HP and Silicon Graphics develop their next-generation 3-D workstation products with the goals of speeding the number of transformations per second and the polygon fill rate, several other players are readying their own entries for the three-dimensional graphics race.

DEC is the most obvious possible vendor to next enter the market. The company is known to be working with Evans & Sutherland Computer Corp., a Salt Lake City-based interactive graphics supplier, on a 3-D graphics workstation product and is expected to introduce it by the end of the year, probably in early fall. DEC currently has the fourth-largest installed base of technical workstations (behind Apollo, HP and Sun Microsystems, Inc.) and just last month unveiled an aggressive strategy for the low end.

In IBM's case, the question is not whether a 3-D workstation will be introduced, but exactly when. Both DEC and IBM have been slow to offer competitive workstations, but of the two, IBM has the most catching up to do. The Personal System/2 Model 80 lacks floating-point capability and graphics hardware-assist, while the RT Personal Computer continues to be used more frequently as a multiuser commercial system than as a single-user stand-alone technical workstation.

Sun, one of the fastest hares in the low-end workstation race, has been the unmoving tortoise in high-end graphics contests. Just to enter this race, Sun must introduce a competitive 3-D workstation. It is a good bet, though, that the company has too much market savvy to pass up this opportunity.

Intergraph Corp., which formally entered the technical workstation arena early this year with its Fairchild Clipper chip-based Interpro 32C workstations, will apply the graphics expertise garnered from more than a decade of being a DEC OEM.

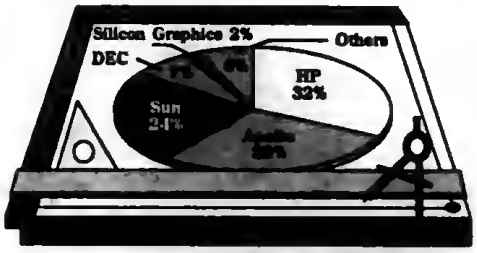
One of Intergraph's strongest suits has always been high-resolution display terminals, which includes dual-screened systems that assist in computer-aided mapping. Intergraph President Jim Meadlock has claimed that he can out-manufacture anybody, except perhaps IBM and DEC. No doubt he means it.

Late this year, Dana Computer, Inc. in Sunnyvale, Calif., and

Continued on page S11

A graphic simulation of numerically controlled *tool-path generation. Image generated on a Silicon Graphics, Inc. Iris workstation using Camand software from Camax Systems, Inc.*

Presence in the worldwide technical workstation market
1986 installed base of U.S. vendors



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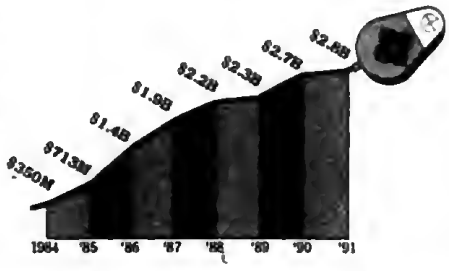
CW CHART: MITCHELL J. HAYES

Technical workstation marketplace
Worldwide installed base for U.S. vendors projected through 1991



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CW CHART: AMY J. SWANSON

Brown is program manager of technical computing research service at International Data Corp. in Framingham, Mass., and analyzes CAD/CAM, technical workstations and other technical computing markets.

Clash

CONTINUED FROM PAGE S3

group networking. One observer finds this area so contentious that she calls the competition "the network wars."

Users want networking on PCs to share laser printers and data and to support E-mail. Advanced networks for workstations are asked to perform a more critical and demanding task — distributing applications so they run partially on one machine and partially on another or totally on a remote processor that has extra power available. Workstation networks can provide all the power of networked minisupercomputers to any user of a workstation attached to the same network.

Sharing processors speeds everyone's work and disputes the minicomputer and mainframe manufacturers' argument that workstations are inefficient because they may sit idle during the day or night.

A look at the leaders

The exact nature of the battle that is forming can be made clearer through a detailed comparison of the salient features of the high-end offerings from IBM and Apple and the entry-level workstations from Sun, Apollo, DEC and HP.

WORKSTATION networks can provide all the power of networked minisupercomputers to any workstation attached to the same network.

IBM and Apple are included in this comparison to illustrate how similar their new high-end offerings are in raw power to traditional workstation offerings. The other four companies are obvious choices because they have the largest installed (or about to be installed) base, according to market reseach firm International Data Corp. (IDC) in Framingham, Mass.

Vicki Brown, IDC program manager for technical workstations, estimates that HP was the leader at the end of 1986 with 33,800 workstations installed. Apollo followed closely with 30,000. Sun was third with 24,900 (up 560% from the end of 1985), and DEC followed with 6,900. Brown projects that DEC could skyrocket to nearly 27,000 installed units by the end of this year. Many other large and small vendors, such as NCR Corp., Unisys Corp., Honeywell, Inc. and Xerox Corp., also offer technical workstations.

Despite the fact that these vendors offer performance equivalent to the leaders and, in at least Xerox's case, offer even easier to use operating environments, workstations from these companies are not considered by most large buyers of engineering workstations. Rather, the success of these vendors lies in sales to users of their own mainframe computers or, in the case of the Xerox 6085, to users of other Xerox computer-aided publishing workstations.

Table 2 (see page S2) contains much of the data most often requested by buyers of workstations. It looks at both hardware and software and provides technical specifications for each vendor's product. Table 1 (see page S3) extends the comparison to costs of basic and more powerful configurations.

These tables were constructed on the foundation laid by Amy Wohl in the April issue of *The Wohl Report on End-User Computing*, which undertook a comprehensive comparison of the Mac II and PS/2 Model 80, as well as a review of the entire new IBM line. Additional data was supplied by representatives of Apple, IBM, Sun, Apollo, DEC and HP.

The tables bring into sharp relief the major differences among the participants as well as the areas in which they have chosen to follow the same paths.

Processor: Except for IBM and DEC, all the leading vendors selected Motorola's 68020 processor. IBM used Intel's 80386, and DEC used its proprietary 78032 processor.

Real memory (standard and maximum): IBM and Apple offer 1M byte of random-access memory (RAM) as standard. Apollo offers 2M bytes, and DEC, HP and Sun offer 4M bytes of RAM as standard. At maximum, Sun's Model 3/50 and HP's Model 318M offer 4M bytes, while DEC can go to 6M bytes, Apollo to 8M bytes, Sun's and HP's color workstations to 12M bytes and IBM to 16M bytes. The Macintosh wins with a maximum memory of 1.5G bytes.

Floating-point coprocessors: These are standard on all except IBM and Sun, which offer them as options.

Floppy disks: Only Sun does not offer floppies. Sun users load programs from the network or from tape.

Hard disk: All vendors offer at least 80M bytes, The Mac II has the smallest capacity drives. Apollo and HP offer the largest drives, up to 348M bytes and 571M bytes, respectively. Of more importance than capacity is the access time of the drives. Each vendor offers different types of hard drives with different access times. The slowest are the smaller drives. HP's 20M-byte drive has 75-msec access. DEC and HP's 40M-byte drives offer 48-msec access. IBM's 44M-byte drive has 40-msec access. Most of the remainder are around 30 msec. Sun offers the fastest drives — 23 msec for its 141M-byte drives.

Expansion slots: IBM offers PS/2-compatible slots, whereas Apollo offers AT- and XT-compatible slots. Sun and HP

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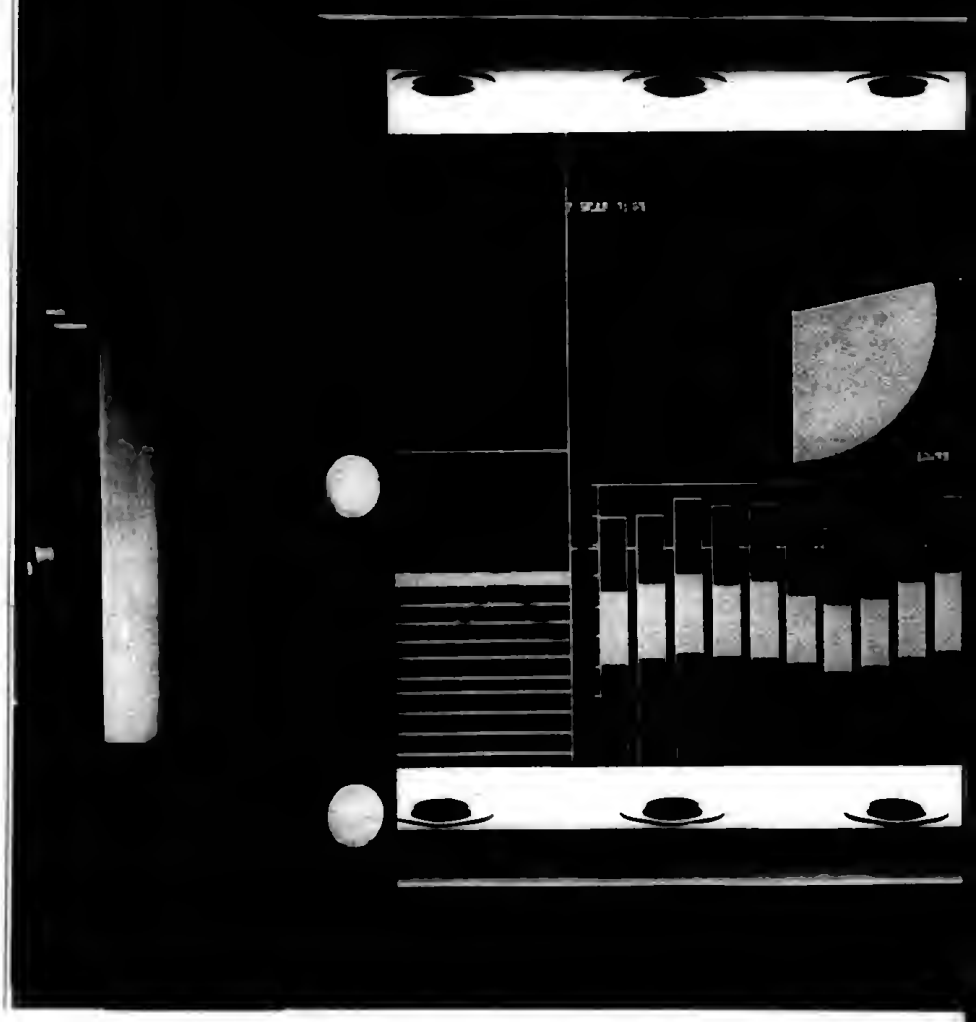

offer Motorola's VMEbus slots as an option on their color workstations but have no bus on their entry-level monochrome systems. Apple offers Nubus plus small computer systems interface ports. DEC does not offer expansion slots.

Operating system: Every vendor has a proprietary operating system. IBM will run OS/2; Mac II runs the Macintosh operating system; DEC runs VMS. Although Sun, Apollo and HP run derivatives of Unix, each of the others offers, or will soon offer, its own Unix derivative. Apollo holds a leadership position in this area, offering the University of California at Berkeley's Unix 4.2 and AT&T's Unix System V and MS-DOS without requiring a coprocessor. The others offer either optional MS-DOS coprocessor boards at approximately $2,000 to $3,000 or MS-DOS network servers that can put MS-DOS on multiple workstations.

Networking: Comparisons in this area are difficult but important. Apple offers the slowest network access (at 232K bit/sec.) through Appletalk but has just started shipping a new Ethertalk connector that runs the full 10M bit/sec. The other vendors offer Ethernet and, in several cases, token-ring as well. Apollo has the fastest network. Its 12M bit/sec. token-ring network outperforms the competition by 20%.

Number of programs: Operating system differences lead to large differences in numbers of available programs. IBM's PC-DOS wins with more than 20,000 programs, and DEC is second with 3,500. Apple offers 2,500 Mac programs; Apollo lists 1,700; HP, 1,100; and Sun, 900 in each vendor's respective catalog. But each company can also run Unix programs not listed in its catalog.

Multitasking: Each vendor, other than IBM and Apple, offers multitasking now. IBM has promised first-quarter 1988 availability for multitasking, and industry analysts say they believe Apple will also offer multitasking by late 1988.

Addressable memory: All vendors offer at least 64M bytes of virtual address space, which is more than enough for even the sloppiest programmer.

Graphics screen resolution: Sun has the greatest resolution (1,152 by 900 pixels) followed by DEC (1,024 by 864 pixels), Apollo (1,024 by 800 pixels) and HP (1,024 by 768 pixels). IBM and Apple offer 480 by 640 pixels as standard, although higher resolutions are available on optional equipment.

Colors: Sun and the Mac II provide 256 colors as standard, and HP offers 64. The other companies offer 16 colors as standard (at their highest resolution). An option to increase the number of colors to 256 and beyond is available from Apollo.

Reliability and maintainability: Using cost of maintenance as a guide, HP is the clear winner at $18 per month. DEC places second with $45 per month, and Sun is third at $49. Apollo falls last at $73 per month. These are prices for next-day on-site maintenance for diskless workstations. Similar data from the other vendors was not available.

Points of strength

Each of the vendors is preeminent in at least one area. These strengths are as follows:

IBM: The PS/2 Model 80 offers a fast processor and a large amount of real memory. However, it is IBM's name combined with the PC-DOS, or OS/2, operating system that makes IBM stand out. The 10 million users of IBM-compatible PCs will consider the Model 80 a natural upgrade to their current hardware. Further, IBM has promised transparent connectivity to other IBM computers in its OS/2 Extended Edition and through its ephemeral Systems Application Architecture's transparent movement of programs from the PS/2 to IBM's minis and mainframes. If IBM delivers on this promise, the PS/2 will appeal to many technical computer users whose data or application programs reside on IBM mainframes.

Apple: The Mac II also offers a natural upgrade path, this time for the one million current Macintosh users. But its most important characteristic is its enforced user interface that makes software extraordinarily easy to use. Users find every new program easy to learn because its interface is familiar.

The Macintosh is also responsible for having revolutionized text and graphics integration, now called desktop publishing. These capabilities are fully integrated in the Mac II.

Another Apple exclusive is Nubus. Third-party boards designed to be compatible with Nubus are automatically configured by the Macintosh operating system. Users need only plug in a compatible, a higher resolution graphics card or a compatible coprocessor, and the operating system automatically knows it is there and how to use it.

DEC: The Vaxstation 2000 is the undisputed price leader at $4,600 for a diskless workstation sporting a multitasking operating system and at least 1,000 lines of resolution.

In addition, DEC's VMS and Vaxcluster offer unique benefits to buyers of

BUYING VMS workstations offers VAX users transparent integration between desktop and larger computers and, consequently, savings in training and software costs.

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Vaxstations. VMS is the same operating system that runs on the tens of thousands of larger VAX computers found in engineering, scientific and commercial settings throughout the world. Everyone who runs a VAX can use the Vaxstation 2000 to off-load processing and improve response time.

In fact, through the Vaxcluster networking system, the larger VAX can be a file server for diskless Vaxstations. Buying VMS workstations offers VAX users transparent integration between desktop and larger computers and, consequently, savings in training and software costs. DEC's Vaxcluster offers a network operating system that automatically shifts jobs to the most appropriate processor, thus optimizing the use of processors and speeding work.

Apollo: Apollo combines expandability — through its AT- and XT-compatible expansion slots — with the fastest network offering. Apollo's token-ring network is at least 20% (12 million bit/sec. vs. 10 million bit/sec.) faster than the Ethernet offerings favored by most of its competitors.

Apollo also offers a unique dual-ported Unix operating system that runs both University of California at Berkeley's Unix 4.2 and AT&T's Unix System V. In addition, Apollo has the only software-based MS-DOS compatibility on the Motorola, Inc. 68020 processor. The vendor also offers a standard facility that captures all text sent to any window on the screen.

Apollo's Domain Network Operating System can distribute part or all of specific tasks to multiple remote processors, even if they are not Apollo workstations.

Sun: Sun's workstations offer the highest resolution, the largest screens (19 in.) and the fastest disks.

The vendor also offers a connectivity advantage that appeals to many software developers. Sun's Network File System (NFS) architecture has been adopted by so many computer vendors that developers using Sun workstations can build distributed applications that know how to access data on a wide variety of computers. To date, more than 120 vendors, including Alliant Computer Systems Corp., Convex Computer Corp., Computer Consoles, Inc., Data General Corp., Gould, Inc., HP (under HP/IX) Silicon Graphics, Inc., Wang Laboratories, Inc., Texas Instruments, Inc. and even DEC under its Ultrix operating system, have announced compatibility with the connectivity of Sun's NFS architecture.

"THERE will always be low-end, mid-range and high-end workstations. But today's high end will be the low end of tomorrow."

CARL MACHOVER
MACHOVER ASSOCIATES CORP.

HP: HP has established the largest installed base, partly because it started the color engineering workstation market eight years ago with its 9845/C workstation and partly because the corporation has long served the workstation needs of instrument control users. HP offers an operating system called Rocky Mountain Basic OS, which was designed to meet the needs of that user community.

HP's workstations are bought primarily by owners of HP 3000 minicomputers. New companies are taking a closer look at HP, though, because it focuses more directly on total cost of ownership rather than simply initial capital expenditures.

HP's $18-per-month maintenance fee is 75% less than Apollo's and 60% less than DEC's charge for maintaining a comparable workstation. Lower maintenance fees generally reflect greater reliability or at least greater manufacturer confidence in the machine.

The future of workstations

What has been discussed here is what workstation vendors call the low end of the workstation market. Higher performance

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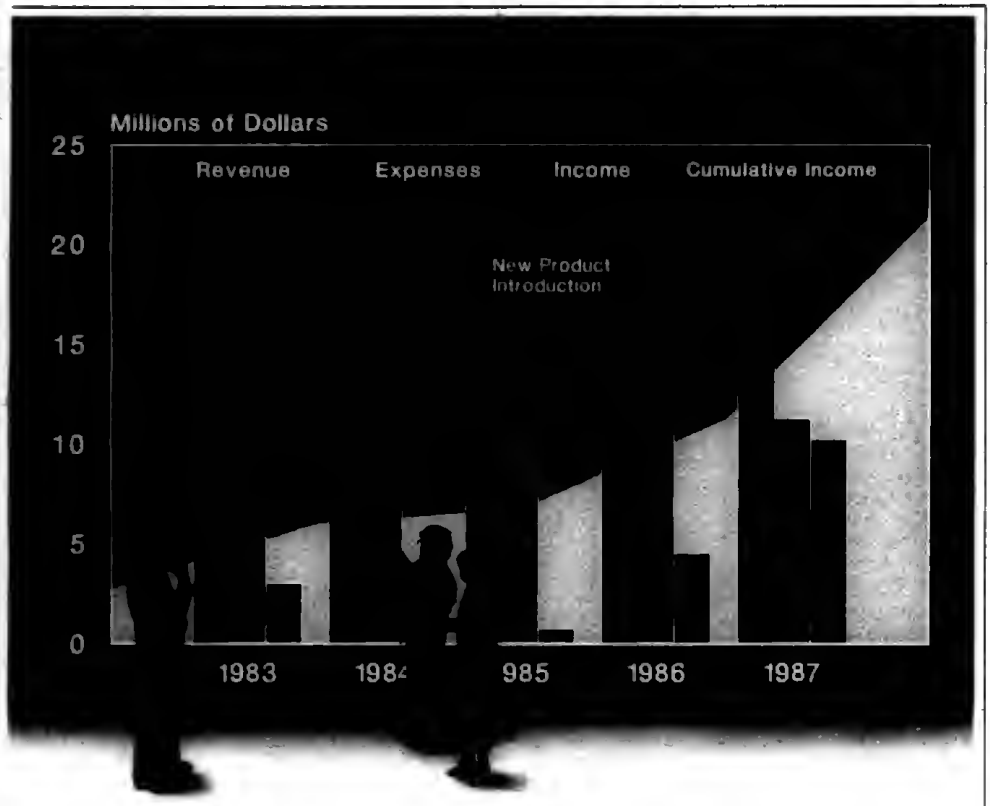

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Raster graphics add life to designs

BY CHARLES P. LECHT

A major weakness in just about all of today's vector graphics systems is their inability to generate movies of their output without the use of film — that is, to create computer-driven real-time animated movies at low cost.

The majority of affordable systems employ technologies that drive displays with very slow refresh rates. Also, the methods by which pictures are created and manipulated require extensive mathematical computations per frame, so even if display refresh rates could be sped, the calculation time would make animated output impossible unless very high-cost vector-processing systems were used to perform the computation.

Beyond these two problems, there is also the storage issue. Vast memory would be needed to store the frame data. Animated movies, computer-produced and shown in real time, require the computer to display frames at speeds of at least 15 frames per second.

Bit-map solution

The solution is to mix vector graphics systems technologies with those we call bit-mapped or raster graphics on low-cost systems. Bit-mapped graphics allow the creation of photographic-quality images without the laborious computation that accompanies vector graphics images. Although there have been instances of its use within supercomputer environments, bit-mapped graphics software for less powerful systems was unavailable until this decade.

In the early 1980s, innovations in display and software technologies, as well as in logic and memory, set the stage for bit-mapped graphics breakthroughs. No longer burdened by hardware constraints, people started to create the software needed to animate photographic-quality images that were either drawn or captured with video equipment.

Picture making is at the heart of any graphics system, be it vector or bit-mapped. Bit-mapped software can aid in producing anything from simple two-dimensional pictures to beautiful three-dimensional images. Systems using this type of software (sometimes referred to as "painting systems") provide users with the electronic tools needed to capture their results on film or paper.

Today, the use of bit-mapped picture-creation systems is commonplace; science-fiction films, TV commercials, cartoons and even business presentations employ it. While the transferral process to film or videotape has been cumbersome and demanding of a certain amount of after-the-fact laboratory processing, the results achieved are as good or better than those obtained from conventionally made pictures. Recent developments in bit-mapped graphics now offer the promise that film may be avoided altogether.

Quickness and ease

Real-time computer-produced and computer-generated movies are already feasible and are getting ever better. Picture data base encoding methods are emerging that feature increasingly lower memory usage per frame. The fact that memory requirements are dropping at the same time that larger and faster memories are becoming available means that longer film sequences, paged from disk, may be stored in random-access memory. Once there, a relatively simple program may be used to interpret frame-description parameters and flash pictures on the screen as fast or faster than we experience while watching conventional movies.

Although this is a much-simplified description of the process, movies can be produced very quickly and can be easily altered by professionals and amateurs alike. In practical terms, this means having the potential to do things like featuring beautifully rendered engineering drawings in a moving sequence that shows the results of the multiplicity of decisions that go into a product design or to create a 3-D electronic wind tunnel on a screen.

It is true that real-time movie-making systems cannot currently store, retrieve and display high-resolution million-color pictures, but they are still useful anyway. In the world of computer-produced picture making, a large (if not the largest) need is for simple images to consist of only a few colors. From weather maps to business charts to quick sketches of just about anything, it is this basic type of graphics that we encounter most often. The best painting systems

Continued on page S10

Lecht is chairman of Lecht Sciences, Inc./Japan, a Tokyo-based software think tank specializing in graphics. He is also an elected public member of the Hudson Institute and a free-lance writer on science topics.

VENDOR VIEWPOINT
Drawing distinctions among today's graphics workstations

BY PAUL BEMIS

Until recently, designers, drafters and others involved in product modeling and styling were effectively limited to wire-frame representations by the processing and graphics constraints of their computers.

Today, a new generation of system architecture and hardware technology enables users to rapidly create and display complex three-dimensional scenes. Consequently, computer graphics workstations and applications are moving in the direction of solids rendering, which is clearly a more effective and accurate approach to modeling.

With these new capabilities comes the need for a clear understanding of some of the more subtle features of high-performance graphics workstations, including the workings of the graphics pipeline, the piece of the system hardware that actually draws the images on the display.

Most of today's sophisticated solid modeling applications generate polygonal models of the geometric data to be rendered by the graphics subsystem. But simply generating polygonal models is not enough for every situation. There are differences among systems that make some more capable than others for certain tasks.

In wire-frame representation, the boundaries of the model are drawn using vectors. This is sufficient to convey geometric information about simple models, but wire-frame modeling becomes confusing once realistic data bases, such as for an automobile engine, are rendered.

Although graphics devices have been able to render these data bases as solid models for years, the performance was too slow to be practical for dynamic interaction.

The introduction of systems that allow users to interact with existing models rendered in a solid form is the next step in the evolution of graphics workstation technology.

Today's systems provide additional modeling features and benefits, including environmental lighting and material control, independent of the modeling data base.

The manner in which light strikes an object can reveal a great deal about its geometry. By simulating real-world lighting accurately, additional insight into existing polygonal data bases can be discerned. Unlike vector representation of 3-D models that have no surfaces, solid polygonal 3-D display requires properties of light to illustrate depth and promote realism.

When a model is lighted correctly, the smoothness of a curved surface can be examined as closely as the surface of your automobile after you wax it. Aircraft designers use bright spotlights to determine the smoothness of the wing and fuselage design, which are directly related to drag. Industrial designers are interested in how products look under colored fluorescent lights.

When users are able to choose among many lighting alternatives for illumination of their geometric creations, the result is realistic model representations that enable the user to investigate many alternative designs without having to physically build a model.

After considering the necessary graphics features, the potential buyer must then turn his attention to the performance issue.

Most suppliers of graphics systems talk in terms of polygons per second as a measure of the speed of their workstation. However, the speed at which polygons are created is only a small part of the story.

When comparing workstations, simple performance figures such as polygons per second, vectors per second or transforms per second, can be more misleading than specifying CPU performance with ratings such as million instructions per second or Whetstones.

How can a solid object be smoothly rotated if it takes half a second to clear the screen between each rendering? How usable is a system that renders quickly but takes minutes to load a display list from the CPU before it can start?

Beyond the creation speed, it is important to know the access time to get polygonal data into the geometry pipeline, the transform speed, the cost in compute time of each light in a scene and the overhead cost if the machine does not support lights.

Each of these parameters must be understood before one can determine if a particular application will perform well on a given workstation.

Never trust a polygon

Polygons take on many shapes and sizes, so classifying performance based exclusively on polygons per second is misleading. The term "polygon" does not constrain the number of vertices requiring computation, nor does it constrain the size.

Trade-offs must be made early in the design phase that optimize the system for solving a particular set of problems. These designs should be cognizant of the growth in complex geometry that is desired to be viewed. Today's engineering development environment is heavily influenced by the desire to rapidly display and manipulate complex 3-D polygonal models that are made up of thousands of polygons. The goal should be to display increasingly larger and more complex models.

Some vendors will mask deficiencies by claiming high speeds on polygons that best meet the constraints of their system. It is therefore important to ask about the size and number of vertices in the polygons being measured and whether the polygons in the measurement are smooth or flat shaded.

Typically, flat-shaded polygons will render faster because the render processor does not need to interpolate each pixel during draw time.

There is currently no industry standard by which the performance of graphics can be measured. Understanding the issues surrounding their performance will, however, help users find their way through the confusion to a graphics workstation that meets their particular requirements. ●

TODAY'S SYSTEMS provide additional modeling features and benefits, including environmental lighting and material control, independent of the modeling data base.

Bemis is a senior product manager at Apollo Computer, Inc., and works closely with the company's research and development organization.

Mechanical/architectural design software

COMPANY	PRODUCT NAME	TYPICAL USE	UNIQUE FEATURES	TWO- OR THREE-DIMENSIONAL	TYPES OF 3-D MODELING SUPPORTED	CONFIGURATION/DRAWING MANAGEMENT SOFTWARE	INCLUDES USER PROGRAMMING LANGUAGE	PROGRAMMABLE MENUS	INTERACTION METHOD(S)	ON-SCREEN CROSS-HATCHING	IGES[1] SUPPORTED FOR INPUT, OUTPUT OR BOTH	IGES VERSION SUPPORTED	ROTATION FREE OR IN 90° INCREMENTS	DIMENSIONING: ANSI, ISO OR BOTH	AVERAGE NUMBER OF SEATS PER CPU	PRICE PER COPY
Abvent, Inc. (313) 669-5187	Space Edit	Architectural, engineering, interior design	Multiple layers, walk-through mode, line removal, 2- or 3-point perspective	Both	Wire-frame, solids, shaded	Yes	No	No	Keyboard, mouse, tablet	Yes	—	2.0	Rotation free	Associative	1	$625
ACDS Graphics Systems, Inc (818) 770-0631	Facilities Management Product	Building management, leasing, structural, architectural	Fully integrated data base and graphics systems	Both	Wire-frame	Yes	Yes	Yes	Keyboard, mouse, tablet	Yes	Both	2.0	Rotation free	Both, with some exceptions	1 to 5	Contact vendor
Adra Systems, Inc. (617) 937-3700	Cadra-II	Mechanical design and drafting	1/10 second average response, proprietary hardware	2½-D	NA	Yes	Optional	Yes	Tablet, stylus	Yes	Both	3.0	Rotation free	Both, also JIS & BSI	1	From $14,750 (including hardware)
American Chamelo, Inc (617) 862-4441	DIAD	Mechanical design and drafting, solids modeling, drawing office management	Associative dimensions, alignment ability to incorporate complex double curved surfaces within solid model, ability to take data from parts listing and apply to drawing office management	Both	Surface solids	Yes	Yes	Yes	Keyboard, mouse, tablet	Yes	Both	2.0	Rotation free	Both	4	From $9,000
	Applicon Bravo 3	Electro-mechanical CAD[2]/CAM[3]/CAE[4]	—	Both	Wire-frame surface solids	Yes	Yes	Yes	Keyboard function keys, pen, tablet	Yes	Both	3.0	Rotation free	Both	4 per Microvax II, more on larger systems	Contact vendor
Automation Technology Products, Inc. (408) 370-6000	Cimplex	CAD, CIM	Solids modeling system with specialized CIM data base supporting manufacturing and PDD standard	3-D	Wire-frame, surface, solids	Yes	Yes	Yes	Keyboard	Yes	Both	2.0 parametric entities	Rotation free	General Dimensions + Tolerance on solids	Hardware-dependent	Contact vendor
Auto-Trol Technology Corp. (800) 233-2882	Series 7000	Mechanical design and manufacturing	Integrated with relational DBMS	Both	Wire-frame, surface, solids	Optional	Yes	Yes	Keyboard, mouse, tablet, on-screen menus	Yes	Both	3.0	Rotation free	Both	1	Contact vendor
	Series 5000	Architectural Toolbox	Integrated with relational DBMS	Both	NA	Optional	Yes	Yes	Keyboard, mouse, tablet, on-screen menus	Yes	Both	3.0	Rotation free	Both	1	Contact vendor
Battelle Columbus Division (614) 424-6983	[illegible]	Mechanical CAD/CAM	Associative data base, collision detection	3-D	Wire-frame, surface, solids	No	No	Yes	Mouse with menus	Yes	Both	2.1	Rotation free	Both	1	$16,000-$25,000
Cadkey Division of Micro Control Systems (203) 647-0220	Cadkey	3-D design engineering	3-D system with open architecture programming language	3-D	Wire-frame	Yes	Yes	Yes	Keyboard, mouse, tablet, digitizer	Yes	Both	3.0	Rotation free	Both	1	$3,195
Cadworx, Inc. (313) 662-6000	Retriever	Land surveying, mapping	Interfaces with all popular data collectors, Hewlett-Packard Co. HP 41	Both	Surface	NA	Yes	Yes, limited	Keyboard	NA	Output	3.0	Rotation free	NA	1 in a microcomputer, also runs on Apollo and VAX	$3,495
Cadsoft Systems (317) 844-7137	3D CAD	Mechanical design	PC-based, 3-D CAD	3-D	Wire-frame planes	No	No	No	Keyboard, mouse	No	No	NA	Rotation free	ANSI	1	$349
Camax Systems, Inc. (612) 854-0004	Camand	Manufacturing engineering	Numeric control machining, mold design, mold analysis	3-D	Surface	Yes	Yes	No	Keyboard, mouse, on-screen menus	Yes	Both	3.0	Rotation free	Both	1	$30,000-$90,000
Carrier Corp. (315) 432-6838	E2000 Toolkit	Computer-aided drafting on HVAC	Macros, fonts and symbols for Autocad and Versacad	2-D	NA	No	Yes	Yes	Keyboard, tablet	Yes	Both	3.0	Rotation free	NA	—	$595
Carr Lane Manufacturing Co. (314) 647-6200	Tool Designers Assistant	Workpiece fixture design process	Full-scale, flexible, hand-drawn, not digitized	Both	Wire-frame	No	No	No	Keyboard, mouse, tablet	No	Input	2.0, 3.0	Rotation free	NA	NA	Contact vendor
Cascade Graphics Systems, Inc. (714) 474-6200	Atlas	Architectural, mechanical, electronics, chemical engineering and HVAC	—	2-D	NA	—	—	Optional	Keyboard, mouse, joystick, tablet, other	Yes	—	—	—	ANSI	—	$1,990
Cimline, Inc. (312) 230-7300	Cim CAD	2-½-D design, detailing and drafting	Two-way integration, user interface customizable by user, versions available for factory floor	2½-D	NA	Optional	Yes	Yes	Keyboard, mouse	Yes	Both	—	Rotation free	Both	1	$4,495
	Cim Edit	Editing drawings into Cimline environment from other 2- and 3-D CAD systems	—	2½-D	NA	No	Yes	Yes	Keyboard, mouse and free	Yes	Both	2.0	Rotation free	Both	1	$2,995
	Parametric Modeling	Parts design and drafting	Dynamic memory allocation	2½-D	NA	No	Yes	Yes	Keyboard, mouse and icons	Yes	Both	3.0	Rotation free	Both	1	$2,995
	Cim Solid	3-, 4- or 5-axis drafting	Multiple-axis drawing	3-D	Wire-frame,	No	Yes	Yes	Keyboard, mouse and icons	Yes	Both	3.0	Rotation free	Both	1	$3,495
Com-Code Associates, Inc. (313) 663-6811	DP-200	Mechanical drafting	Construction lines, isometric grids	2-D	NA	No	Yes	Yes	Keyboard, mouse, tablet	Yes	Both	3.1	90-degree increments	ANSI	—	From $1,295
Compuserve Co. (800) 272-8833	Mouse	Generating engineering, architectural drawings	2-D, 3-D design, drafting with capability of 40 separate layers on Mac Plus	Both	Wire-frame, solids	—	Yes	No	Mouse	Yes	Both	3.0	Rotation free	Both	1	$495
Control Data Corp. (612) 642-3840	ICEM Plus	Mechanical, electrical, CAD/CAM/CAE	Applications integrated under one information management system to manage data across product life cycle	3-D	Wire-frame surface solids	Yes	Yes	Yes	Keyboard, mouse, tablet	Yes	Both	2.0, 3.0	Rotation free	Both	1 on a workstation to 60+ on largest processor	From $6,300
Cosmic (404) 542-3265	Nastran/Nascad	3-D modeling	Interfaces with Universal Analytics' Nastran program for structural analysis, interface for APT language, used for numerically controlled machining, robotics application strategy planner	Both	Wire-frame, surface, solids	Yes	Yes	Yes	Keyboard	Yes	Both	3.1	Rotation free	—	—	$3,998
Data Automation (619) 743-3334	DCS-2000	Mechanical drafting	Contains command file, curve-fitting splines, arc and	2-D	NA	Yes	Yes	Yes	Keyboard, tablet	Yes	Both	3.0	Rotation free	ANSI	1	$2,495
Davidson Graphics (617) 670-0800	PEAC	Facilities management	Inserts drawings into CPU for customer	2-D	NA	Yes	No	No	Keyboard, mouse, tablet, thumbwheels	Yes	NA	NA	Rotation free	Neither, proprietary	20	$5,000-$20,000
DPI/Systems, Inc (300) 239-4677	Facilities Design Management System	Interior architectural planning and management	—	2-D	NA	—	Yes, limited	No	Keyboard, mouse	No	No	NA	Rotation free	NA	1	Contact vendor
	Idraw	Drafting	—	2-D	NA	Yes	Yes	Yes	Keyboard, mouse	Yes	Both	3.0	Rotation free	NA	1	Contact vendor
Eclat Intelligent Systems, Inc (818) 463-2030	EI Versaquest	CAE, AEC[5]	Integrates multiple data bases with CAD drawings, specifically specifications data other (pictures) images and electronic catalogs (CD-ROM)	Both	Versacad function	Yes	Yes	Yes	Keyboard, mouse, tablet	Yes	Both	3.0	Rotation free	Both	1	$3,995

[1]Initial graphics exchange specification [2]Computer-aided design [3]Computer-aided manufacturing [4]Computer-aided engineering [5]Architectural engineering construction [6]Computer-aided design and drafting

The companies included in this chart responded to a recent telephone survey conducted by *Computerworld*. Further product information is available from vendors.

Clash

CONTINUED FROM PAGE S8

workstations offer features such as attached processors for accelerating complex computation and high-performance graphics processors that can display shaded 3-D solid models of objects moving in real time.

One of the most respected observers of the technical workstation market, Carl Machover, president of Machover Associates Corp., describes the future in these words: "There will always be low-end, mid-range and high-end workstations. But today's high end will be the low end of tomorrow."

Frank Casanova, product manager at Apollo, echoes that sentiment when he notes that, when IBM's PS/2 workstation capabilities catch up with Apollo's, "we will be another generation ahead."

A topic in more contention among computer industry watchers is the question of whether future workstations will be built on proprietary platforms — integrating processors from one manufacturer and other components from others — or on standard platforms from the largest, lowest cost producers, such aa the Vaxstation or the IBM PS/2, with high-performance graphics boards and coprocessors added in. New graphics boards are already being shown that can write 33 million vectors in one second. At the same time, however, small, virtually unknown workstation vendors are privately demonstrating systems that boast 25 MIPS of processing power.

Many industry watchers say they feel that the low end will move toward standard platforms while the high end will remain proprietary. However, this division of approach may end when the very powerful coprocessors become available for standard platforms.

Among the most controversial issues

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Raster

CONTINUED FROM PAGE S9

(those that produce ray-traced 3-D images of complicated scenes on high-resolution media) are really not needed to produce these. Besides, given the current rate of graphics evolution, the limitations on resolution and palette choice will not persist for long.

Within the next few years, we can expect to see a graphics workstation that will provide an integrated vector and bit-mapped graphics capability for the cost of a personal computer. It will be capable of providing all the color anyone could ask for and, because of its vast memory and high speed, will be capable of producing real-time animated movies of great length for output to a wide range of media.

Vector graphics systems have taken us a long way. They have given us the capacity to define an object and obtain different views of it through rotation and scaling methodologies and, in doing so, have revolutionized design and display processes for airframe manufacturers and architectural and civil engineering firms. They have benefited such diverse fields as medicine, advertising, petroleum research and the movie industry. Only when vector and bit-mapped technologies are combined, however, will we really begin to capture reality. •

COMPANY	PRODUCT NAME	TYPICAL USE	UNIQUE FEATURES	TWO- OR THREE-DIMENSIONAL	TYPES OF 3-D MODELING SUPPORTED	CONFIGURATION/DRAWING MANAGEMENT SOFTWARE	INCLUDES USER PROGRAMMING LANGUAGE	PROGRAMMABLE MENUS	INTERACTION METHOD(S)	ON-SCREEN CROSS-HATCHING	IGES SUPPORTED FOR INPUT, OUTPUT OR BOTH	IGES VERSION SUPPORTED	ROTATION FREE OR IN 90° INCREMENTS	DIMENSIONING: ANSI, ISO OR BOTH	AVERAGE NUMBER OF SEATS PER CPU	PRICE PER COPY
[illegible]	Pro 3-D	[illegible]	Shaded, solids modeling	3-D	Wire-frame, solids	Yes	No	No	Mouse, tablet	No	Both	3.0	Rotation free	[illegible]	1	[illegible]
[illegible] Research, Inc. (314) 421-8771	Evergraphics 3.01	CAD business package	Wide-ranging business purposes	Both	Surface	Yes	No	No	Keyboard, mouse, tablet	Yes	No	NA	Rotation free	NA	NA	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	3-D	Wire-frame, surface, solids	Yes	Yes	Yes	Keyboard, mouse, tablet, on-screen menus	Yes	Both	3.0	Rotation free	Both	6	[illegible]
[illegible] Systems, Inc. (415) 883-3900	[illegible] +	Schematic diagramming	Object-oriented data base, defined connection logic, built-in plotting	3-D	—	No	Yes	Yes	Keyboard, mouse	No	No	NA	90-degree increments	Neither	1	$1,500
[illegible]	[illegible]	[illegible]	[illegible]	3-D	NA	[illegible]	No	No	Keyboard, mouse, tablet	[illegible]	[illegible]	NA	Both	ANSI	1 to 8	Contact vendor
General CAD/CAM, Inc. (818) 395-0033	[illegible]	Drawing exchange between incompatible CAD systems	Full entity intelligence maintenance	NA	NA	No	No	No	Keyboard	NA	No	NA	NA	Both	NA	$1,000-$7,000
[illegible]	[illegible]	[illegible]	[illegible]	3-D	Wire-frame, surface, solids	[illegible]	[illegible]	[illegible]	Keyboard, tablet	No	Both	3.0	—	ANSI	[illegible]	Contact vendor
Haworth, Inc. (800) 442-9678	[illegible]	Design, specifications, management of office furniture	Furniture management, redesign	2-½D	NA	Yes	Yes	No	Keyboard	Yes	Both	—	1-degree increments	—	1	$12,000
[illegible]	[illegible]	[illegible]	[illegible]	3-D	Wire-frame, surface	[illegible]	[illegible]	[illegible]	Keyboard, mouse, tablet	Yes	Both	[illegible]	Rotation free	Both	3	[illegible]
Hewlett-Packard Co.	Hewlett-Packard Design Center Mechanics Engineering Series [illegible]	Drafting, documentation	Integrated design, user interface, traditional design methodology, drafting standards, full dimensioning capability, parts and assembly capability	3-D	NA	—	Yes	No	Keyboard, mouse, tablet	Yes	Input	3.0	Rotation free	Both	1	$9,500
	Hewlett-Packard Design Center Mechanical Engineering Series 10	Drafting, design	Integrated design, user interface, traditional design methodology, flexibility, customization, variational design capability, adaptive design with powerful manipulation, parts assembly structure	3-D	NA	—	Yes	Yes	Keyboard, mouse, tablet	Yes	Both	3.0	Rotation free	Both	1	$10,000
	Hewlett-Packard Design Center Mechanical Engineering Series 30	Modeling, design, drafting	Integrated 3-D and solid model design, user interface, traditional design methodology for creation of solid models, 3-D variational design, 3-D assemblies, state-of-the-art graphics capability	3-D	Solids	—	Yes	Yes	Keyboard, tablet	Yes	Both	3.0	Rotation free	Both	1	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	NA	[illegible]	[illegible]	[illegible]	Keyboard, mouse, tablet, [illegible]	[illegible]	[illegible]	[illegible]	Rotation free	[illegible]	1	[illegible]
ICAM Technologies Corp. (514) 697-8033	CAM-DES	Mechanical, electrical	DFX in and out, full integration with ICAM CAM software	3-D	NA	No	Yes	No	Tablet and/or mouse	Yes	Both	3.0	Rotation free	Both	PC supports 1, VAX supports many	$3,000
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	3-D design	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Keyboard, mouse	[illegible]	[illegible]	[illegible]	Rotation free	[illegible]	[illegible]	[illegible]
[illegible] Corp. (301) 224-3996	[illegible]	Technical illustration	Axonometric projection, shading, masking, vector editing, dynamic dragging	Both	Solids	Yes	Yes	Yes	Keyboard, mouse, tablet	Yes	Both	3.0	Rotation free	ANSI	1	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	Both	Wire-frame, surface, solids	[illegible]	[illegible]	[illegible]	Keyboard, mouse, tablet	[illegible]	Both	[illegible]	Rotation free	Both	1	[illegible]
	[illegible]	[illegible]	—	Both	Wire-frame, surface	[illegible]	[illegible]	[illegible]	Keyboard, mouse, tablet, [illegible]	[illegible]	[illegible]	[illegible]	Rotation free	Both	[illegible]	Contact vendor
	[illegible]	[illegible]	[illegible]	Both	Wire-frame, surface	[illegible]	[illegible]	[illegible]	Keyboard, mouse, tablet	[illegible]	No	[illegible]	Rotation free	Both	[illegible]	[illegible]
Integrated Industrial Information, Inc. (916) 631-1363	CAD Pack	Mechanical design	Communication with IBM mainframes	2-½D	NA	No	No	Yes	Keyboard, mouse, tablet	No	No	NA	Rotation free	Both	1	$2,000
[illegible] Computer Modeling, Inc. [illegible]	[illegible]	[illegible]	[illegible]	Both	Solids	No	No	No	Keyboard, mouse	No	Output	3.0	Rotation free	[illegible]	—	[illegible]
International Graphics Engineering Systems, Inc. (714) 997-0443	Arcad	Architectural design, facilities management	Coordinated geometry for civil engineering	Both	Wire-frame	No	No	Yes	Keyboard, tablet	Yes	Both	3.0	Rotation free	Both	4 or 5	$25,000
[illegible]	[illegible]	Mechanical, architectural	For IBM PC and compatibles	2-, 2-½-D	NA	Yes	Yes	Yes	Keyboard, mouse, tablet	Yes	Both	[illegible]	Rotation free	ANSI	1	[illegible]
	Solid Vision	3-D solids modeling	3-D solids modeling using boundary representation	3-D	Solids	Yes	Yes	No	Keyboard, mouse, tablet	Yes	No	NA	Rotation free	Yes	1	[illegible]
	[illegible]	Architectural, engineering, facilities management	Integrated software modules supporting 2-D, 3-D and solids modeling	Both	Wire-frame, surface, solids	Yes	No	Yes	Keyboard, tablet, joystick	Yes	Both	[illegible]	Rotation free	Both	[illegible]	Contact vendor
[illegible] & Associates, Inc. (303) 761-6876	[illegible]	Land development	Completely integrated land development system, from surveying to finished drawings	3-D	Wire-frame surface	Yes	No	No	Keyboard, tablet	No	Input	3.0	Rotation free	ANSI	8	From [illegible]
Manufacturing and Consulting Services, Inc. (714) 851-[illegible]	Anvil-5000	Mechanical engineering, CAD/CAM	[illegible]	3-D	Wire-frame, surface, solids, [illegible]	Yes	Yes	Yes	Keyboard, tablet	Yes	Both	[illegible]	Rotation free	Both	Varies with hardware	Contact vendor
	Anvil-1000MD	Mechanical engineering, CAD	[illegible]	3-D	NA	Yes	No	No	Keyboard, tablet, joystick	Yes	Both	[illegible]	Rotation free	ANSI	1	From [illegible]

Exploration

CONTINUED FROM PAGE S5

Stellar Computer, Inc. in Newton, Mass., are both expected to introduce 20- to 30-million instructions per second workstations that have the computational performance of the minisupercomputers already on the market and more than five times the graphics capability of today's 3-D workstation leaders.

However, if the price tags of these workstations turn out to fall in the $75,000 to $100,000 price range, as both companies' founders have said they will, then Stellar and Dana could be the industry's new Apollo or Alliant Computer Systems Corp./Convex Computer Corp. in their establishment of new price/-performance levels.

Even in early outline, the next wave of 3-D workstation products clearly demonstrates an ongoing improvement of the price/performance ratio.

The graphics capability first offered on technical workstations in 1982 and 1983 for $40,000 to $50,000 is currently available on the so-called low-end systems for at least one-third the cost. In today's market, it costs less than $18,000, for instance, to purchase a fully configured Apollo Series 3000, which includes a 19-in. color monitor, 1,024- by 800-pixel resolution, a 4M-byte memory and a 155M-byte disk.

EVEN today's top 3-D workstations cannot realistically simulate a human being running in real-time, with on-the-spot calculations. A lifelike image of Michael J. Fox dashing from his apartment for a can of soda, for example, would require millions of polygons — thousands for his face alone.

Although the same economies of scale apply to future products, the performance curve is increasing much faster today than it did in the early 1980s.

Today's three-dimensional graphics workstations are priced at $60,000 to $90,000. In mid-1988, it will be possible for users to buy three-dimensional systems that will provide more than five times the graphics performance for approximately the same price. Prices for workstations that are less functional will decline sharply.

Technical improvements in graphics board sets, combined with the anticipated movement of terminal manufacturers such as Raster Technologies, Inc. into the graphics board business, means that personal computer users will soon have the ability to produce much more than business and presentation graphics on their machines.

Such hardware and graphics advances will make visual computing — the ability to graphically interpret, analyze and visualize information on a computer screen — an easily affordable reality.

More important for the long term, visual computing will enable the development of applications to meet needs that we cannot yet even begin to anticipate. ●

COMPANY	PRODUCT NAME	TYPICAL USE	UNIQUE FEATURES	TWO- OR THREE-DIMENSIONAL	TYPES OF 3-D MODELING SUPPORTED	CONFIGURATION/DRAWING MANAGEMENT SOFTWARE	INCLUDES USER PROGRAMMING LANGUAGE	PROGRAMMABLE MENUS	INTERACTION METHOD(S)	ON-SCREEN CROSS-HATCHING	IGES SUPPORTED FOR INPUT, OUTPUT OR BOTH	IGES VERSION SUPPORTED	ROTATION FREE OR IN 90° INCREMENTS	DIMENSIONING: ANSI, ISO OR BOTH	AVERAGE NUMBER OF SEATS PER CPU	PRICE PER COPY
McDonnell Douglas Manufacturing and Engineering Systems Co. [illegible]	Unigraphics	Electro-mechanical CAD/CAM	Integrated CAD/CAM data base	3-D	Wire-frame, surface, solids	Yes	Yes	Yes	Keyboard, mouse, tablet, joystick	Yes	Both	3.0	Rotation free	Both	4 to [illegible]	Contact vendor
	Graphics Design System (GDS)	Architectural, civil engineering, structural engineering, building services engineering, [illegible]	Object intelligence	Both	Wire-frame, surface, solids	No	Yes	Yes	Keyboard, mouse, tablet	Yes	Both	3.0	Rotation free	—	4	Contact vendor
Mega CADD, Inc. (206) 623-6345	Design Board Professional	3-D modeling, design	Presentations, illustrations, unlimited perspective views	3-D	Wire-frame surface automatic hidden-line removal	No	No	No	Keyboard mouse, tablet	Yes	No	NA	Rotation free	NA	1	$1,750
	Design Board Link	Transfer of drawings to popular drafting products	—	Both	Wire-frame surface	No	No	No	Keyboard	No	No	NA	NA	NA	1	$295
	Design Board Illustrator	Color renderings, slide-show presentations, animation of views created in Design Board Professional	—	3-D	Wire-frame surface	NA	No	No	Keyboard, mouse tablet	Yes	No	NA	NA	NA	1	$95
Microtecture Corp. [illegible]	Datacad	Architectural, engineering CAD	—	Both	Wire-frame, surface	Yes	Optional	Optional	Keyboard, mouse, tablet	Yes	No	NA	Rotation free	Both	1	[illegible]
Micro CAD/CAM (213) 838-7881	MGM Station	Mechanical, industrial design and drafting	Macintosh-oriented	2-D	NA	Yes	No	No	Keyboard, mouse	Yes	Both	3.0	Rotation free	Both	1	$790
Pafec, Inc. [illegible]	Dogs	General-purpose drafting, mechanical, civil, architectural	Runs on 32-bit engineering workstations. Interfaces to wide range of additional products and software	Both	Wire-frame, surface, solids	Yes	Yes	Yes	Keyboard, mouse, tablet, joystick	Yes	Both	2.0	Rotation free	Both	20	$8,000
Palette Systems, Inc. (617) 273-5660	Palette	Mechanical, architectural CAD	High-productivity user interface, flexible interfacing, powerful data base, multidisciplinary, large drawings	Both	Wire-frame surface color shading	Yes	Yes	Yes	Keyboard, mouse, tablet	Yes	Both	3.0	Rotation free	Both	13	From $5,000
[illegible] Engineering Ltd. [illegible]	ECAD	Producing drawings for engineers and draftsmen	Fast cursor-driven planning, [illegible]	3-D	—	Yes	No	No	—	—	No	NA	Rotation free	Both	3	[illegible]
Prime Computer, Inc. (800) 343-2540	Prime Medusa	Design, drafting, manufacturing	Ease of use. 3-D solids from 3-D orthographics, variational geometry	Both	Solids, simulates wire-frames	Yes	Yes	Yes	Keyboard, mouse, tablet, joystick	Yes	Both	3.0	Rotation free	Both also DIN JIS	NA	$15,500
	Prime Medusa/AEC	Design, drafting	Applications-specific integrated circuit shades in variational geometry, scheduling capabilities, topographic attributes	Both	Wire-frame, surface, solids	Yes	Yes	Yes	Keyboard, mouse, tablet, joystick, voice	Yes	Both	3.0	Rotation free	Both also DIN JIS ABC BSI	NA	$7,000
Robo Systems Corp. [illegible]	Robo CAD PC	Drawing, drafting, design, layout	User interface system of pull-down menus, pop-up windows	3-D	NA	Yes	No	No	Keyboard, mouse, tablet	Yes	Both	3.0	Rotation free	Both	1	[illegible]
	Robo Solid	Solids modeling	Models objects from any angle or perspective, [illegible]	3-D	Solids	Yes	No	No	Keyboard, mouse, tablet	NA	Both	3.0	Rotation free	Both	1	From [illegible]
SKOK Systems, Inc. (800) 225-7565	Drawbase	CAD	Drawing and data base management within one product	Both	Wire-frame	Yes	Yes	Yes, limited	Keyboard, digitizing menu	Yes	No	NA	Rotation free	Both	1	$8,000
Structural Dynamics Research Corp. [illegible]	[illegible]	Mechanical CAD	Solids based	3-D	Solids, [illegible]	No	Yes	Yes	Keyboard, mouse, tablet	Yes	Both	2.0, 4.0	Rotation free	Both	—	Contact vendor
Supercads, Inc. (408) 970-0400	Supercads	Mechanical design and drafting	Automatic associative dimensioning, model mode and drawing mode, multiple views	3-D	Wire-frame, surface	Yes	Yes	Yes	Keyboard, mouse, tablet	Yes	Both	3.0, 3.2	Rotation free	Both	1 to 10	Contact vendor
Tektronix, Inc. [illegible]	[illegible]	Mechanical CAD	Low CPU usage	3-D	NA	Yes	Yes	No	Keyboard, mouse, tablet, joystick	Yes	Both	2.0	Rotation free	Both	4+	[illegible]
Unicad, Inc. (800) 331-3739	M/PE	Graphics application development and integration including CAD	User can temporarily interrupt one operation to perform another	3-D	Wire-frame, surface, solids	Yes	Yes	Yes	Keyboard, mouse, tablet, icons	Yes	Both	2.0	Rotation free	Both also DIN BSI	NA	$50,000
[illegible]	[illegible]	Generating hard copy from other CAD packages	Solids rendering, [illegible]	3-D	Wire-frame, solids	NA	Yes	NA	NA	NA	[illegible] (input?)	—	Rotation free	—	NA	Contact vendor
Universal Intergraphics Corp. (714) 980-3992	3-D Graphics CADD	Mechanical design and modeling, structural and architectural design and drafting	Full 3-D design modeling, drafting; fast and flexible with powerful programming facility	3-D	Wire-frame, surface	Yes	Yes	Yes	Keyboard, mouse, tablet	Yes	Both	3.0	Real-time automatic on all three axes at any increment	Both	1	$3,000
VersaCAD Corp. [illegible]	VersaCAD Design	2-D or 3-D design and drafting for general-purpose mechanical designers and architects	Light source and color shading, various 3-D displays, bill of materials reports, and presentation graphics	Both	Surface, solids, wire-frame, [illegible], hidden-line removal and [illegible]	Yes	Yes	Yes	Keyboard, mouse, tablet	Yes	Both	3.0	Rotation free	ANSI	1	[illegible]
	VersaCAD	3-D design and drafting for general-purpose mechanical and architectural designers	Ease of use, powerful construction tools	3-D	NA	Yes	Yes	Yes	Keyboard, mouse, tablet	Yes	Both	3.0	Rotation free	ANSI	1	[illegible]
	VersaCAD Architect	Specialized, enhanced architectural design	Parametric user definitions, [illegible]	3-D	NA	Yes	Yes	Yes	Keyboard, mouse, tablet	Yes	Both	3.0	Rotation free	ANSI	1	[illegible]
	VersaCAD Mechanical	3-D mechanical specialized design	Geometric tolerancing and symbols, associative dimensioning	3-D	NA	Yes	Yes	Yes	Keyboard, mouse, tablet	Yes	Both	3.0	Rotation free	ANSI	1	[illegible]
[illegible] Corp. (800) 553-1177	2D Designer	Mechanical engineering	Metric or English measurements, automatic dimensioning, up to 6-layer drawings, area and angle calculation, merge library parts to plotting sheet	3-D	NA	Yes	Yes	No	Keyboard, mouse	Yes	No	NA	90-degree increments	Automatic	1	$295
Visual Information, Inc. [illegible]	Design and Solid Dimension	Technical design, product design	[illegible] 3-D surface design, [illegible]	3-D	Surface	—	No	Yes	Keyboard, mouse, tablet	No	Both	3.0	Rotation free	NA	1	[illegible] and [illegible]
Weber Systems, Inc. (414) 782-0181	Prompt Plus CAD/CAM	Mechanical CAD for numerically controlled equipment	Drafting, tool cutting integrated, fully NC capable	3-D	Wire-frame, surface	Yes	Yes	No	Keyboard, mouse, tablet	Yes	Both	Most recent version	Rotation free	Both	1	$35,000

Clash

FROM PAGE S10

facing the workstation market is whether IBM's and Microsoft's OS/2 will displace Unix as the operating system of choice among technical workstations.

OS/2's predecessor, MS-DOS, was inferior to Unix in two critical areas: It could not support programs of more than 640K bytes, and it could not support multitasking. But OS/2 will reportedly remove both of these handicaps and will bring to workstations all the desktop productivity tools created for the huge installed base of IBM PCs and compatibles.

Every Unix vendor's version of that operating system varies slightly from the others'. "Unix has to pull itself together to unify," EDS's Shubert says. Right now, each workstation vendor has a stake in differentiating its Unix version from that of its competitors, but if Unix fails to become one standard, developers of desktop productivity tools may shun it in favor of OS/2. If that happens, the days of Unix leadership on workstations may be numbered.

Software decides

In the final analysis, the winners and losers in the workstation market will be selected by software vendors. If the right software is not available for a workstation, no user will buy the equipment.

But what will be even more crucial to the workstation market is the fact that when a software developer selects one workstation over another, that vendor's choice may affect the dynamics of the market for years to come.

For example, Tom Brugerre, president of Mentor Graphics Corp., was influential in making Apollo successful by deciding to develop his computer-aided engineering software to run on Apollo computers and then by reselling those computers to his customers. At one time, Mentor accounted for 35% of all Apollo sales.

If software vendors ever decide to abandon Unix in favor of OS/2 and VMS, a dozen Unix-based workstation manufacturers may face troubled times. The only thing that would keep these software vendors in business would be the add-on sales to users of software that worked exclusively on their machines.

Power on every desk

Even if a shakeout does occur among workstation manufacturers, momentum toward less expensive and more powerful workstations will be continued by the high-performance add-on board manufacturers.

Furthermore, the capabilities now targeted only toward technical professionals will become the basic capabilities on workstations for the professional and managerial worker.

By 1990, the low-end desktop computer will offer 2 to 4 MIPS of processing power to run more sophisticated editing and data retrieval programs. It will offer a large 1,000- by 1,200-pixel screen to make complete documents readable on the screen.

There will be 3M to 6M bytes of RAM available, 100M bytes of mass storage (and/or access to a file server), network connections and a windowing, multitasking operating system.

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Upswing

CONTINUED FROM PAGE 67

ed a year earlier.

The latest was Wang's best quarterly net income performance since earning 40 cents per share in the quarter ended Dec. 31, 1984. Since then, the firm has endured three quarterly losses, three quarters yielding earnings of 5 cents per share or less and three quarters of modest profits between 12 and 16 cents per share.

Analysts speculated that Wang has overcome its most troubled times and that its future prospects are good. "We can forecast that within a year or two, they'll be doing better," said Jay P. Stevens of Dean Witter Reynolds, Inc.

Because of heavy losses in the first two quarters, however, Wang reported a loss of $70.7 million, or 44 cents a share, for the fiscal year.

Some analysts expressed concern that the company needs to develop more exciting products and improve on existing products.

Product revenue grew only 11% from the like quarter last year, while revenue from services and rentals swelled 26% since that time. "You'd like something more positive to look forward to in the product line," said P. Martin Ressinger at Duff & Phelps, Inc. in Chicago.

Wang reported that its Intecom telecommunications equipment subsidiary achieved break-even performance for the first time during this quarter.

Prime. Natick, Mass.-based Prime reported net earnings slightly above industry expectations for the quarter. Earnings were $15.7 million, or 32 cents a share, up 37% from the like quarter last year. Revenue rose 12% to $236 million.

Analysts said that Prime's revenue was in line with expectations, while earnings were slightly better than expected as a result of increased gross margins Prime attributed to high demand for its new high-end 6350 CPU. Prime is looking for acquisitions in the computer-aided design and manufacturing market, according to Myron Kerstetter, an analyst at the Gartner Group, Inc.

Amdahl. The Sunnyvale, Calif.-based mainframe vendor reported a better quarter than expected, primarily because of sales of new products, analysts said.

Net income for the second quarter ended June 26 was $30.9 million, or 60 cents per share, up from $2.7 million, or 6 cents a share, in last year's comparable quarter. Revenue was $341 million, compared with $209.3 million in last year's second quarter. Analysts attributed the massive profit increase to high margins on new products, especially the 5890 Model 300 and disk drives.

This is the first time in recent history that Amdahl's margins have been higher than IBM's, analysts said.

Unisys Corp. Analysts said Unisys seems to be succeeding in its plans to cut expenses, but they gave mixed opinions about the company's long-term growth prospects. The company reported net income for the second quarter of $121.2 million, or 62 cents a share, on revenue of $2.3 billion.

"It's not clear whether there have been any real benefits on the revenue side" as a result of the Burroughs Corp. and Sperry Corp. merger, said William Milton Jr. of Brown Brothers Harriman & Co. in New York. "Can Unisys grow its revenue faster than Burroughs and Sperry would have been able to do individually? I don't think so, but it's too early to tell."

Cost savings for fiscal 1987 are expected to be about $300 million, according to George Podrasky Jr. of Duff & Phelps. An operating margin of 11% in the quarter shows that cost cutting has been effective to date, Milton said. The company also reported a debt-to-capital ratio below 35%, compared with a ratio of 39% at the end of the first quarter and 55% at the time of the Burroughs-Sperry merger.

Unisys expects a strong fourth quarter, following a traditionally slower third quarter, Chairman and Chief Executive Officer W. Michael Blumenthal said in a prepared statement.

Apollo. The Chelmsford, Mass.-based workstation maker reported its fifth consecutive quarter of increased sales and earnings.

Sales for the second quarter ended July 4 totaled $132 million, up 50% from the $88.3 million reported in the like quarter of 1986. Apollo's sales have increased 50% or more from year-earlier levels in each of the past four quarters.

Net income for the period was $7.6 million, or 21 cents per share, a jump of 630% from income of $1.04 million, or 3 cents a share, in the second quarter of 1986. The company's steady growth is in line with industry expectations, with product revenue accounting for 47% of sales, according to John Rutledge, an analyst at Dillon, Read & Co.

But analysts said they believe that Apollo's growth has not come at the expense of its closest competitor, Sun Microsystems, Inc., but that it stems from a period of industrywide growth. In fact, Rutledge noted, Sun is growing twice as fast as Apollo.

Separately, Apollo promoted Roland Pampel to the position of president and chief operating officer. Pampel was previously senior vice-president of technology, manufacturing and marketing. Thomas A. Vanderslice, formerly president, remains chairman and CEO.

Stratus. The Marlboro, Mass.-based fault-tolerant systems maker reported lower than expected profits for the quarter on sales that were slightly higher than expected.

Continued on page 75

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Toshiba ban

CONTINUED FROM PAGE 67

nating Committee on Multilateral Export Controls, the international body that is supposed to prevent such offenses as Toshiba's, is clearly in order. If any good can come out of this mess, perhaps it will be that the committee will finally listen to the critics who have called for stricter controls for years.

But Congress taking matters into its own hands by attempting to legislate an outright ban on the sale of all Toshiba products in the U.S. is not the right answer. That action will mean higher prices for U.S. computer users, who will be forced, for example, to pay the price for Apple Computer, Inc. having to find a new source for some of its printers. It will cost American jobs, not only at Toshiba America, Inc.'s plants but also at companies that resell or distribute Toshiba products. And potentially most damaging of all, it could easily touch off the full-scale trade war whose specter has haunted U.S.-Japan relations for most of this decade.

Some members of Congress seem to feel that because we have caught Toshiba red-handed, we now hold all the cards. That is very dangerous thinking.

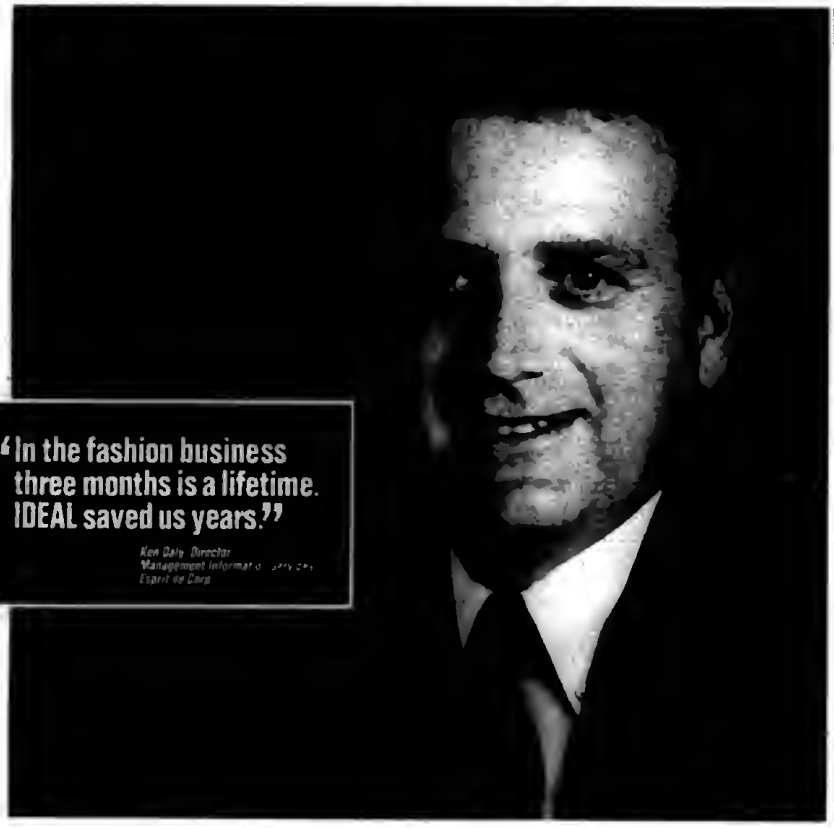
If we have learned anything from our staggering trade deficits with the Japanese, it is that Japanese corporations, working closely with their government, can identify and achieve their common goals in international competition. Their idea of free enterprise is much more cooperative among themselves than in the U.S. — which taught them the concept.

SOME MEMBERS of Congress seem to feel that because we have caught Toshiba red-handed, we now hold all the cards. That is very dangerous thinking.

Thus, banning Toshiba from exporting to the U.S. invites Japanese retaliatory measures, whether officially sanctioned or not. Imagine the devastating consequences for Amdahl Corp. users, for example, if other Japanese companies chose to punish their U.S. OEMs for the U.S. government's treatment of Toshiba. The thought may be farfetched, but it demonstrates that the current U.S. economy, especially the computer industry, does not benefit from decisions made in a cold-war us-vs.-them mentality.

The current call in Congress is: "Hit Toshiba where it hurts — in the pocketbook." If that is going to be the blind approach to trade policy, U.S. companies and those that use their products are going to feel some pain as well.

Wilder is *Computerworld's* senior editor, computer industry.



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Proteon

CONTINUED FROM PAGE 67

man Howard Salwen declined to discuss future product directions, but they did say Proteon is beta-testing Texas Instruments, Inc.'s IEEE 802.2-compatible software, which will provide full IBM interoperability, including Advanced Program-to-Program Communications and 3270 communcications, Salwen said. "TI's software is targeted at a special market where if you can't do everything that IBM is doing, then you can't compete there," he added. Proteon will support IBM's 16M-bit Token-Ring and Microsoft Corp.'s MS OS/2 LAN Manager only if its users demand it, Salwen said.

The vendor is also taking a "wait-and-see" attitude on IBM's Netview. "IBM has seven Netview products, and they are all different. The only thing the same is the seven letters," Salwen said.

In addition, Proteon is revamping its distribution, moving away from distributors and focusing more heavily on resellers and systems integrators that are closer to the end user, a spokeswoman said. Half of Proteon's sales come through indirect distribution channels.

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Upswing

FROM PAGE 73

Sales were $42.7 million, up 42% from $30.1 million reported in last year's second quarter. Net income, however, came in only 19% higher, at $3.8 million, compared with $3.2 million reported last year.

OEM sales to IBM and Ing C. Olivetti & Co. made up about 30% of the company's business for the quarter, its highest OEM revenue percentage to date. The lower gross margins on OEM sales and the higher costs incurred by the company in expectation of more direct-sales volume account for the disappointing profit growth, analysts said.

Lotus Development Corp. The Cambridge, Mass., microcomputer software vendor had a strong quarter, with the firm's efforts to diversify beginning to pay off. Sales rose 42% to $94 million, and net income rose 38% from the previous year's quarter to $16.3 million, or 66 cents per share.

Despite a reported record quarter for the firm's flagship product, 1-2-3, other products are gaining a larger share of Lotus revenue.

Sales of products in the firm's Information Services Division, which include compact disk/read-only memory products and on-line data, were up from last year's quarter, although Lotus declined to break out the division's results.

International sales were also strong, moving from 24% of revenue for the previous year's quarter to 28%. Sales of Lotus's Symphony software were up some 15% from the previous year's quarter.

But Lotus said sales of Jazz for the Apple Computer, Inc. Macintosh are still lagging. "Jazz didn't do well and hasn't for a while," Yeomans said.

Software Publishing. The Mountain View, Calif., microcomputer software house continued to rebound from its record downturn of 1986. The firm reported revenue for the third quarter ended June 30 of $8.3 million, up 81% from $4.6 million reported in the like quarter last year.

Net income was $881,000, or 11 cents per share, compared with a net loss of $737,000, or 10 cents per share, in the year-earlier period.

Texas Instruments, Inc. TI reported a healthy quarter, as expected, with revenue up 10% from the like quarter of 1986.

TI announced revenue for the second quarter ended June 30 of $1.37 billion, up from $1.24 billion in the like quarter of 1986. Net profit was $62 million, or 73 cents a share, up from $12.3 million, or 12 cents a share, in last year's second quarter.

Profit from operations was $51 million, compared with $28 million in 1986. Overall profit for the quarter included pretax royalties of $29 million from the settlement of patent litigation with seven Japanese chip makers and from extraordinary credits from tax-loss carryforwards.

TI's semiconductor business operated profitably for the quarter, in contrast with last year's second-quarter loss.

TI's data systems profit declined because of the transition to new computer and peripherals products, a TI spokesman said.

EDS. The Dallas-based General Motors Corp. subsidiary saw its second-quarter revenue growth plunge to 1%, and most analysts said they believe the balance of this year will be the same or worse. EDS's earnings growth of 15% was better but far below its growth rates for the past several years.

EDS reported profits of $72 million, or 59 cents per share, on revenue of $1.08 billion. Year-earlier earnings were $62.7 million, or 51 cents per share, on revenue of $1.07 billion.

Senior Editors Clinton Wilder and Douglas Barney contributed to this story.

1987 second-quarter earnings

A rising industry tide lifts Wang, Prime, Amdahl and Apollo; Stratus's growth slows

Company	Net income April-June (millions of dollars)	Percent change from 1986	Revenue April-June (millions of dollars)	Percent change from 1986
Amdahl	30.9	+1,044	341	+62.8
Apollo	7.8	+630	132.2	+50
Computer Consoles, Inc.[1]	0.9	—	35.8	+8
Computer Task Group, Inc.	2.1	-7	41	+16
Maxtor	1.7	-59.5	50.9	+50
Northern Telecom, Inc.	73	+26	1.25B	+17
Prime	15.7	+37	236	+12
Software Publishing[2]	0.9	—	8.3	+81
Stratus	3.8	+18.7	42.7	+42
Tandon	1.1	-15	41.1	+18
TI	62	+82	1.37B	+10
Wang	32	+3,900	824	+15

[1]Reported loss of $886,000 in 1986
[2]Reported loss of $737,000 in 1986

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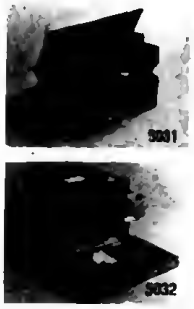

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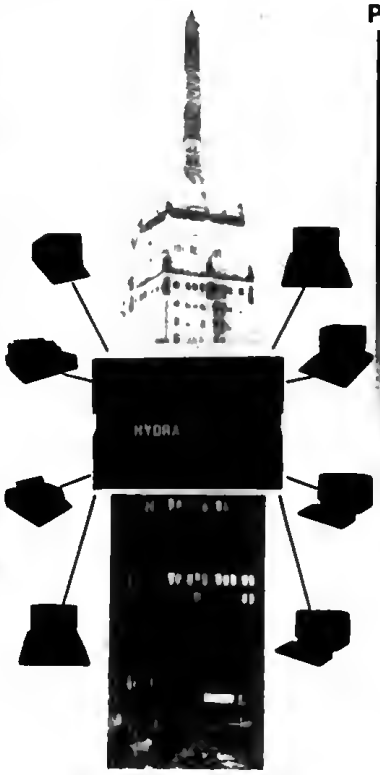

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EMPLOYMENT TODAY

Sizing up the right career fit

Large shops offer technology, but small ones provide instant recognition

BY CONNIE WINKLER
SPECIAL TO CW

MIS professionals searching for their next position often look to the large, well-known companies. Though the prominence of these companies conveys a certain amount of prestige, small companies can offer unique opportunities that will greatly enhance career development.

"Many professionals join small companies to avoid the drone syndrome," says Jesse Castillo, a principal at Technology Strategy, Inc. in Cambridge, Mass. "In a large company, it is easy to get lost — to come into the office at 9 a.m. and leave at 5 p.m., with people not really noticing you are there. You do not directly impact the bottom line. At a small company, almost everything you do affects the company. If you put in extra hours, you have an impact. The results are seen immediately."

The person who functions best in the small company environment must necessarily be self-motivated, ambitious, independent and, above all, must possess a lot of common sense, Castillo adds.

Another difference between small and large organizations is that large companies are often in a better position to train inexperienced employees.

Bigger may be better

"Many DP professionals fresh out of college go to work for medium and large companies, which may be the most appropriate and mutually beneficial course," says Charles Fountain, MIS manager for the Boston Consulting Group in Boston. "Opportunities in large companies are formal and structured, with job descriptions and defined areas of work."

Recent graduates can put their textbook skills to work immediately and then grow into more demanding assignments, becoming familiar with the business as a whole.

"In a small organization with 10 or fewer in data processing, we want someone to come in and do something right away. We don't have the support to assign new employees to be tutored by a team of four to six experienced professionals," Fountain says.

One of the reasons large shops are so attractive is that they usually use state-of-the-art hardware and software and programming aids, says Louis LaPierre, a DP consultant with the recruiting firm of Romac & Associates in Portland, Maine.

Additionally, the large, well-funded shops usually emphasize training and provide in-house instructors to keep employees aware of new developments.

Tendency to typecast

The downside of the big firm is that employees are more likely to be typecast. For example, once someone is identified as a financial systems expert, they will always be assigned to financial projects. However, large companies are currently trying to change this stereotyping by posting jobs throughout the company.

"If you are in the financial systems group at one of those companies that allows you to transfer to another department, you will have to go through the formal channels, and there are no guarantees," LaPierre says. "It depends on the company."

At a small company, employees will more likely become involved in a variety of projects. "You will get maximum exposure in a small amount of time to a lot of systems. You learn a lot," LaPierre adds.

But the opportunity to work on a variety of projects is not always as attractive as it sounds. While being exposed to different projects in a large company usually involves title changes and pay increases, in a small company, such extra effort is simply viewed by the employer as doing your job.

"If growth, titles and promotions are what you are looking for, work for a large company," Fountain says.

> WHILE being exposed to different projects in a large company usually involves title changes and pay increases, in a small company, such extra effort is simply viewed by the employer as doing your job.

But typically, the "fast-track" jobs in large companies are in large cities, even though the companies also rely on departments located in small communities.

Large companies also offer significant benefits packages, says Steven Martin, DP employment specialist at the Advanced Systems Division of Northrop Corp. in Pico Rivera, Calif. "Northrop has multidiversified projects; not all our eggs are in one basket," Martin says. "If you are talented, there's room for you to move."

At the large defense contractor, which employs about 40,000 people, fringe benefits reach the sublime; the firm offers everything from van pools and education reimbursements to a Bible club and martial arts, Martin says.

Life in a tiny shop

DP shops cannot get much smaller than the one that supports Cathedral City, Calif. Michelle Johnson, information systems specialist, is the sole DP professional, doing everything from applications development to changing printer paper on the Hewlett-Packard Co. HP 3000 system. Johnson says she welcomes the responsibility: "It's all me; they rely on me for everything. That's nice."

Trained as a programmer and previously assigned to the city's accounting office, Johnson says she also enjoys the camaraderie the DP position provides. "There's more of a sense of oneness. I know everyone I work with," she says. "I like the personal side."

Sometimes, because Johnson is the only computer professional, it is difficult and time consuming to explain the DP needs to other city officials, who give the final approvals. But that difficulty is improving as city officials become more familiar with the systems' capabilities.

Winkler is a free-lance writer based in New York. Her latest book, *Careers in High Tech*, was published this spring by Simon & Schuster, Inc.'s Prentice-Hall Press.

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This position requires a minimum of 2 years experience with DATAMANAGER, and a minimum of 3 years experience working within the IBM MVS, IMS DB/DC and TSO/ISPF environments.

Send resume and salary history in confidence to:

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RESEARCH TRIANGLE OPPORTUNITIES

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Submit resumes to: Ms. Sara Springmeyer #7-145, Minnesota Department of Jobs and Training, 690 American Center Bldg. 150 E. Kellogg Blvd., St. Paul, MN 55101

PROGRAMMER/ANALYST. Analyze design, code & implement computer programs for the Customer Pin Profile Syst of various banking institutions. Revise existing programs. Prepare test spec's for each computer program. Prepare manuals for individual programs & group back-up & recovery. De-bug existing programs. 2 yrs exp or 2 yrs rel exp - Systems Analyst/Systems Designer. Bach. deg. Math. or Computer Sci. Must know: OS/MVS, TSO/ISPF, LIBRARIAN/VS, IMS/VS, COBOL, CICS/Command Level, & large IBM mainframe hardware (as 4341 & 3031). $32,000/yr. 40 hrs/wk. Pinterton Computer Consultants, Inc. 20 Broad St. Suite 1302, NYC 10005. Send Resume. Attn: AJ #347

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CSIRO – AUSTRALIA

RESEARCH STAFF

PROGRAM LEADERS – COMPUTER NETWORKING
– SOFTWARE ENGINEERING
PROJECT LEADER – GRAPHICS TECHNIQUES

$A36,421-$A64,206

DIVISION OF INFORMATION TECHNOLOGY
LABORATORIES IN CANBERRA, MELBOURNE AND SYDNEY

THE DIVISION. The Division of Information Technology has recently formed laboratories in Sydney, Melbourne and Canberra supporting collaborative research and development programs in the following fields:

- Computer networking
- Software engineering and related hardware
- Information management
- Image processing and graphics

Within several of these programs there are now vacancies for the senior scientists and engineers needed to lead in the following areas of research.

ADVANCED GRAPHICS TECHNIQUES (SRS/PRS)
Reference No. A4584

GENERAL: The Centre for Spatial Information Systems in Canberra is conducting research in the areas of databases, spatial inferencing, image processing and graphics.

The project on advanced graphics techniques is concentrating on the representation, manipulation and display of three-dimensional and time varying data. Current activities include terrain modelling and human kinetics analysis.

Activities planned involve the development of techniques for interpreting scientific and engineering data on advanced graphics workstations such as APOLLO DN580.

DUTIES: To develop and direct research in the area of advanced graphics techniques, with special emphasis on interactive techniques for interpreting scientific and engineering data.

QUALIFICATIONS: Applicants should possess a PhD degree or equivalent qualifications in a computer discipline. Extensive research experience with computer graphics and related areas, particularly with techniques for 3-D modelling, scene synthesis and computer animation is essential.

Experience with complex modelling programs in an applications discipline (e.g. quantum chemistry, plasma physics, civil engineering) is desirable.

LOCATION: The appointee will be based at the Division's Centre for Spatial Information Systems in Canberra.

COMPUTER NETWORKING (PRS/SPRS/CRS)
Reference No. A4539

GENERAL: The Computer Networking Group based in Melbourne, with some activity in Sydney, is conducting research into networking infrastructures which include the Australian Academic Research environment, two experimental networks in Sydney and Melbourne, an OSI demonstration environment, and novel distribution mechanisms for Unix news via a satellite.

Open Systems interconnection is another major research interest of the group, with participation in the setting of standards both locally and internationally as a major focus of the program. The research also includes analysis of communications standards using formal techniques and product development of prototype implementations.

New methods of data transmission and modes of information management and display are to be included in an extension of the existing research program.

DUTIES: The appointee will be responsible for the following functions:

- To direct research at both laboratories in all aspects of computer networking and to identify further network related research within the developing objectives of the Division.
- To manage the Melbourne Laboratory (which is dedicated to networking projects) with the support of a local complement of administrative staff.
- To manage the networking research projects within the Sydney Laboratory and at those other sites where we collaborate with other institutions.

QUALIFICATIONS: Applicants should possess a PhD degree or equivalent qualifications in a computer networking discipline. Experience in the management and conduct of research and implementation of projects with computer networks and their components of at least 10 years duration.

LOCATION: The appointee will be based at the Division's laboratory in Carlton, Melbourne.

SOFTWARE ENGINEERING AND RELATED HARDWARE (PRS/SPRS/CRS)
Reference No. A4540

GENERAL: The Software Engineering and Related Hardware Group based in Sydney with some activity in Melbourne is conducting research into aspects of Fifth Generation computing, both hardware and software.

Major research areas include:

Parallel Systems Architecture: the development of a data flow computer in collaboration with the Royal Melbourne Institute of Technology, including hardware, systems software, and a number of end-use applications.

Software Engineering of Expert Systems: the application of software engineering methods to artificial intelligence applications, particularly expert systems. Techniques employed include relational database, data dictionary and formal specifications (the Z language). Application is to two major second generation expert systems.

Content-Addressable Memory: Development of an inexpensive hardware content-addressable memory and its applications to a number of areas, including Prolog clause indexing, expert systems, and intelligent front end to data-base system.

DUTIES: The appointee will be responsible for the following functions.

- To direct research in the above areas in collaboration with a number of other organisations, including tertiary institutions, research laboratories, and industry.
- To identify and exploit further opportunities for strategic or tactical research in these and related areas, especially with industry.
- To provide, or supervise the provision of, consulting services to other CSIRO Divisions and other organisations in the architecture and procurement of major artificial intelligence applications.
- To supervise the staff of the group, numbering about 10 professionals.

QUALIFICATIONS: A PhD degree or equivalent proof of research excellence in a computing or related discipline. Demonstrated research experience in artificial intelligence or related fifth generation technology. Experience with the development and management of sizeable software projects delivered to an end user and used in practice. Experience with software engineering technology. Demonstrated facility in productively coordinating loosely structured collaborative research.

Experience with relational database design and an ability to work closely with digital systems engineers is desirable.

LOCATION: The appointee will be based at the Division's Headquarters in North Ryde, Sydney.

CONDITIONS: Appointments will be for an indefinite term. However, applications will be considered from individuals interested in negotiating a term appointment. Applications should state the candidate's preference. Australian Government Superannuation benefits are available. To facilitate collaboration with the industrial and academic communities, provision will be made for secondments in both directions.

SALARY:

Senior Research Scientist (SRS)	$A36,421-$A41,861
Principal Research Scientist (PRS)	$A43,428-$A49,256
Senior Principal Research Scientist (SPRS)	$A51,870-$A56,983
Chief Research Scientist (CRS)	$A58,042-$A64,206

Applicants for senior posts should also be able to offer a distinguished record of research accomplishments and give evidence of research leadership ability of a high order. Appointment at the Senior Principal Research Scientist or Chief Research Scientist levels requires the appointee to have an international reputation.

MORE INFORMATION: Prospective applicants are invited to telephone Dr G.E. Thomas, telephone no. (02) 887 9307, for further information. Mr R.D. Lipscomb, telephone no. (02) 887 9365, can also provide a copy of the detailed job description and selection criteria for each position.

APPLICATIONS: Stating relevant personal particulars, including details of qualifications and experience, the names of at least two referees and quoting the relevant reference number(s) should be directed to:

The Chief CSIRO Division of Information Technology
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Positions require 1-2 years RPG experience for System 34/36 along with 1/2 years experience with UNIX* and "C" language.

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Please submit a current resume, a brief statement of qualifications for the position, and the names, addresses and telephone numbers of five references who can assess and emphasize relevant experiences.

Nominations and/or applications should be sent by August 15, 1987, but will be considered until the suitable candidate is found.

Applications should be sent to:

Dr. James E. Hogan, Chair
Search Committee for Director of Data Processing Center
Dinand Library
College of the Holy Cross
Worcester, MA 01610

COLLEGE OF THE HOLY CROSS

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- MVS systems programming experience: CBIPO, IOGENS, SMPE, some BAL
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Sandra J. Long
University of Illinois
National Center for Supercomputing Applications
605 E. Springfield Avenue
Champaign, Illinois 61820

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COMPUTER CENTER ASSISTANT DIRECTOR

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Reference #DP-1-87

Duties: the Director of Data Processing is responsible for the direction and administration of the department to include all aspects of operations, systems and applications. Develops departmental plans and objectives, supervises and manages personnel, coordinates the purchase, installation and maintenance of system hardware and software, directs the analysis and upgrades of existing systems, long-range planning and budget preparation, responsible for hiring, training, discipline and evaluation of department staff, assists with contract management and evaluation, manages a $3.1 million annual budget, prepares comprehensive reports for the City Manager, performs related duties as required.

Requires 5 years progressively responsible management/supervisory experience in data processing, bachelors degree in Computer Science or related field desired, demonstrated ability to effectively manage multi-projects, excellent interpersonal and communication skills required. Prefer 10 years experience in data processing, 3 years experience working with IBM DOS/VSE, VM/SP operating systems or on the IBM 43XX mainframe computer, familiarity with CICS.

Completion of supplemental qualifications questionnaire is required. City application and supplemental questionnaire forms must be received by 5:00 August 7th, 1987. City of Alexandria, VA, City Hall, Personnel Office, Room 2500, 301 King Street, Alexandria, VA 22314 (703) 838-4422

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S/38-600	0.98	8 to 16
S/38-700	1.1	16 to 32
*9375-60	1.2	8 to 16
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3090-180	9.2	32 to 64
3081D	10.0	16 to 32
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3081GX	11.9	16 to 64
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*3090-400E	56.0	128 to 256
*3090-600E	76.0	128 to 256

* First Installation 1987
† First Installation 1st Qtr 1988

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5880	28.6	32 to 256
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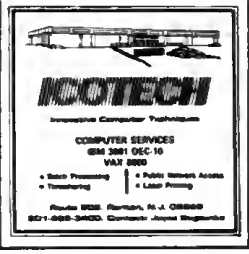

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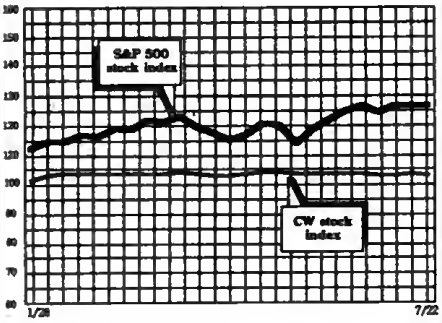

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Leasing Companies	119.7	120.4
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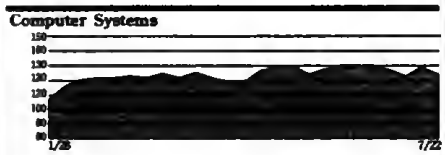
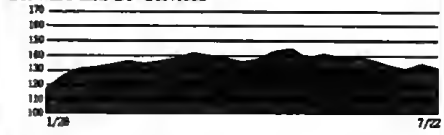
Communications

Computer Systems

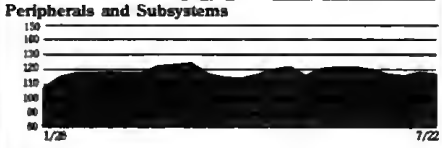


Software and DP Services

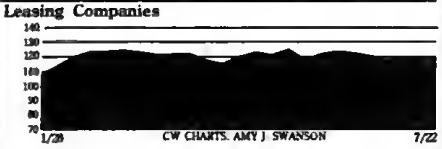


Semiconductors

Peripherals and Subsystems



Leasing Companies



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Computerworld Stock Trading Summary

CLOSING PRICES WEDNESDAY, JULY 22, 1987

Communications and Network Services

E		52-WEEK RANGE (1)		PRICE CLOSE JULY 22 1987	WEEK NET CHNGE	WEEK PCT CHNGE
N	AMERICAN INFO TECHS CORP	101	77	83.00	-0.8	-1.0
Q	ANDREW CORP	19	14	15.00	+0.0	+0.0
Q	ARTEL COMM CORP	5	2	2.88	-0.1	-4.2
N	AT&T	32	22	30.63	+0.4	+1.2
Q	AVANT GARDE COMP INC	7	3	2.75	-0.4	-12.0
Q	AVANTEK INC	19	13	14.00	+0.0	+0.0
N	AYDIN CORP	38	18	32.75	-0.8	-2.2
N	BELL ATLANTIC CORP	77	62	65.50	+0.0	+0.0
N	BELLSOUTH CORP	48	35	37.00	-1.0	2.6
Q	BRIDGE COMMUNICATION	27	11	21.00	2.1	9.2
Q	COMPRESSION LABS INC	13	4	4.88	-0.1	2.5
Q	COMPUTER NETWORK TECH	9	4	4.31	+0.5	+13.1
Q	CONTEL CORP	50	27	32.50	-0.4	-1.1
Q	DATA SWITCH CORP	9	5	9.50	-0.3	-3.7
Q	DIGITAL COMM ASSOC	40	17	34.50	-0.8	-2.1
Q	DYNATECH CORP	44	27	25.75	-0.8	-2.5
Q	EQUATORIAL COMM DD	9	2	3.25	-0.1	-3.7
Q	GANDALF TECHNOLOGIES	11	5	9.25	+0.0	+0.0
Q	GENERAL DATACOMM INDS	14	8	9.25	-0.6	-7.0
N	GTE CORP	43	34	38.38	+0.1	+0.3
Q	INFOTRON SYS CORP	13	7	9.50	-1.0	-10.5
N	ITT CORP	68	47	62.00	+0.0	+0.0
N	M A COM INC	19	12	14.88	+0.6	+4.4
Q	MCI COMMUNICATIONS CORP	10	5	7.50	-0.3	-3.2
Q	MICOM SYS INC	19	10	10.38	-1.4	-11.7
Q	NETWORK SYS CORP	19	9	10.25	+0.1	+1.2
N	NORTHERN TELECOM LTD	24	14	21.63	-0.8	-3.9
Q	NOVELL INC	27	9	19.25	-1.8	-8.3
N	NYNEX CORP	73	58	68.50	+0.3	+0.4
N	PACIFIC TELESIS GROUP	31	23	25.25	-0.3	-1.0
N	PARADYNE CORP	9	4	6.88	-0.1	-1.8
A	PENRIL CORP	6	4	4.63	-0.1	-3.6
N	PLESSEY PLC	41	24	34.13	2.6	7.5
N	SCIENTIFIC ATLANTA INC	50	9	16.88	-1.8	-9.4
N	SOUTHWESTERN BELL CORP	41	23	50.00	-0.9	-1.8
Q	3 COM CORP	24	9	19.50	-1.4	-7.7
N	TIME PLUS INC	41	14	31.63	+0.4	+1.2
Q	UNGERMANN BASS INC	16	7	11.63	-2.0	-14.7
N	US WEST INC	62	45	46.75	-1.3	-2.5

Computer Systems

Q	ALLIANT COMPUTER SYS	37	18	20.25	-1.0	-4.7
Q	ALPHA MICROSYSTEMS	7	3	5.13	+0.1	+1.2
Q	AUTOS COMPUTER SYS	17	10	12.50	+0.0	+0.0
A	AMDAHL CORP	42	17	26.75	-3.3	-8.1
Q	APOLLO COMPUTER INC	25	9	19.00	-0.8	-3.8
Q	APPLE COMPUTER INC	45	19	42.50	-1.5	-3.4
N	BOLT BERANEK & NEWMAN	50	37	39.25	-1.0	-3.5
Q	BRITTON LEE INC	5	3	2.63	-0.1	-4.5
N	COMPAQ COMPUTER CORP	51	12	46.63	-0.4	-0.8
Q	COMPUTER AUTOMATION INC	17	2	12.50	+1.0	+9.7
A	COMPUTER CONSOLES INC	12	7	8.38	-0.9	-9.5
Q	CONCURRENT COMP CORP	19	11	18.25	+0.0	+0.0
N	CONTROL DATA CORP DEL	39	50	26.50	-0.4	1.3
Q	CONVERGENT TECH	12	4	7.25	-0.4	-4.9
Q	CONVEX COMPUTER CORP	22	9	14.75	-1.0	-6.3
N	CRAY RESH INC	138	69	97.50	-5.0	-4.9
Q	DAISY SYS CORP	13	6	7.75	-0.1	-1.8
N	DATA GEN CORP	39	25	29.88	-1.5	-4.8
N	DATAPOINT CORP	9	4	6.25	-0.1	2.0
N	DIGITAL EQUIP CORP	175	84	158.50	-7.1	-4.3
N	FLOATING POINT SYS INC	21	9	11.00	-0.3	-2.2
N	GOULD INC	22	18	20.38	+0.3	+2.5
N	HARRIS CORP DEL	43	27	34.75	+0.3	+0.7
N	HEWLETT PACKARD CO	67	37	59.88	-2.8	-4.4
N	HONEYWELL INC	88	58	63.38	-2.3	2.6
N	IBM	170	119	151.38	-6.0	-3.9
Q	INFORMATION INTL INC	17	13	14.50	+0.3	+1.8
Q	IPL SYS INC	3	2	3.25	+0.0	+0.0
Q	MASS COMPUTER CORP	10	5	8.25	-0.8	-8.3
N	MATSUSHITA ELEC INDL LTD	188	75	147.25	+1.3	+0.9
Q	MEGADATA CORP	7	2	5.25	-0.3	-4.5
Q	MENTOR GRAPHICS CORP	34	11	26.38	-0.1	-0.4
N	NBI INC	14	9	12.88	-0.5	-3.7
N	NCR CORP	50	42	75.75	-2.1	2.7
N	PRIME COMPUTER INC	50	19	26.00	2.3	-8.0
Q	PYRAMID TECHNOLOGY	12	4	8.25	-0.8	-8.3
Q	STRATUS COMPUTER	41	19	26.50	-8.5	-19.7
Q	SUN MICROSYSTEM INC	48	11	26.13	-1.9	-4.9
Q	SYMBOLICS INC	6	4	3.88	+0.0	+0.0
N	TANDEM COMPUTERS INC	38	18	26.50	-2.9	-8.1
N	TANDY CORP	56	31	43.88	-1.9	3.8
N	ULTRAMATE CORP	30	13	27.25	-1.9	-6.4
N	UNISYS CORP	132	84	126.50	-3.4	-2.6
A	WANG LABS INC	19	11	18.25	-0.1	-0.8

Software & DP Services

Q	ADVANCED COMP TECH	6	3	3.63	+0.0	+0.0
N	ADVANCED SYS INC	25	12	23.25	-0.3	-1.1
N	AGS COMPUTERS INC	22	9	15.63	-0.8	-5.0
Q	AMERICAN MGMT SYS INC	19	7	15.00	+1.4	+6.4
Q	AMERICAN SOFTWARE INC	22	7	15.88	+0.6	+4.1
N	ANACOMP INC	10	3	9.00	-0.5	-5.3
Q	ANALYSTS INTL CORP	9	3	7.75	1.0	11.4
Q	ASHTON TATE	50	10	24.75	-1.5	-5.7
Q	ASK COMPUTER SYS INC	17	9	13.38	-0.5	-3.8
Q	AUTODESK INC	285	8	22.00	-0.3	-1.1
N	AUTO DATA PROCESSING	51	29	46.75	1.8	-3.9
Q	BOOLE & BABBAGE INC	11	4	11.00	+0.3	+2.3
N	COMPUTER ASSOC INTL INC	28	10	23.88	-0.6	3.0
Q	COMPUTER HORIZONS CORP	15	10	14.00	+0.9	+6.7
N	COMPUTER SCIENCES CORP	81	50	51.88	3.4	-6.1
N	COMPUTER TASK GROUP INC	19	11	12.50	-0.8	5.7
Q	COMSHARE INC	28	11	24.50	+1.0	+4.3
Q	CULLINET SOFTWARE INC	13	9	12.00	+0.0	+0.0
Q	CYCARE SYS INC	13	7	9.38	-0.3	-2.9
Q	DUQUESNE SYS INC	33	12	16.00	2.4	-12.9
Q	ENDATA INC	12	5	9.88	-1.9	-15.0
N	GENERAL MTRS (CLS E)	45	24	42.00	-0.1	-0.3
Q	HOGAN SYS INC	17	9	11.00	-1.8	-13.7
Q	INFORMIX CORP	23	7	19.75	+0.5	+2.8
Q	INTELLICORP INC	11	4	7.75	+0.0	+0.0
Q	ISAC INC	10	5	7.75	-0.3	-3.1
Q	LOTUS DEV CORP	37	9	31.50	+1.3	+4.1
Q	MANAGEMENT SCI AMER	21	11	12.38	+0.0	+0.0
Q	MICRO PRO INTL CORP	6	2	5.81	+0.5	+9.4
N	MICROSOFT CORP	128	28	100.00	2.3	2.2
Q	NATIONAL DATA CORP	27	17	25.00	+1.3	+5.3
Q	ON LINE SOFTWARE INTL INC	50	8	15.63	-1.3	7.0
N	ORACLE SYS CORP	50	7	21.50	-2.3	-9.5
N	PANSOPHIC SYS INC	23	12	19.00	1.8	-8.4
Q	POLICY MGMT SYS CORP	50	15	24.75	+0.0	+0.0
Q	PROGRAMMING & SYS INC	13	9	11.50	+1.0	+9.5
Q	REYNOLDS & REYNOLDS CO	42	27	33.00	+0.0	+0.0
Q	SEI CORP	18	9	16.75	-0.3	-1.5
Q	SHARED MED SYS CORP	53	23	28.00	+0.1	+0.4
Q	SOFTWARE AG SYSTEMS INC	50	10	13.25	1.0	7.0
Q	SOFTWARE PUBG CORP	17	5	8.13	-0.4	-4.4
A	STERLING SOFTWARE INC	19	9	10.13	-1.1	-10.0
Q	SUNGARD DATA SYS INC	21	10	19.25	+0.3	+1.4
Q	SYSTEMATICS INC	50	14	26.25	+0.8	+2.9
N	UCCEL CORP	48	19	39.75	-0.8	-1.9
Q	URS CORP	21	13	18.25	-0.3	-1.4
Q	VM SOFTWARE INC	45	15	17.00	1.5	-9.1

Semiconductors

N	ADV MICRO DEVICES INC	25	13	16.88	-0.8	-4.9
N	ANALOG DEVICES INC	24	14	21.25	+0.0	+0.0
Q	ANALOGIC CORP	13	10	11.88	-0.1	-1.0
Q	INTEL CORP	51	16	48.50	-1.8	-3.6
Q	LSI LOGIC CORP	17	9	10.00	-0.9	-8.0
Q	MONOLITHIC MEMORIES INC	19	10	14.25	-0.9	-5.8
N	MOTOROLA INC	64	34	55.13	-2.3	3.8
N	NATL SEMICONDUCTOR	17	6	13.13	-0.9	-6.3
N	TEXAS INSTRS INC	88	34	50.50	-2.8	-4.2
A	WESTERN DIGITAL CORP	33	11	27.75	+1.3	+4.7

Peripherals

N	AM INTL INC	9	6	7.13	+0.3	+3.6
Q	AST RESH INC	23	11	14.75	+1.5	+11.3
Q	AUTO TROL TECH CORP	9	3	6.50	+0.5	+8.3
Q	BANCTEC INC	19	9	12.50	-0.9	-6.9
Q	CIPHER DATA PRODS INC	19	9	10.25	-0.5	-4.7
A	COGNITRONICS CORP	5	2	3.88	-0.4	-8.0
N	COMPUGRAPHIC CORP	24	16	23.25	+0.0	+0.0
N	COMPUTERVISION CORP	23	11	15.00	-0.9	-4.0
N	CONRAC CORP	30	12	27.25	+0.0	+0.0
Q	DATAPRODUCTS CORP	19	10	11.13	+0.4	+3.3
A	DATARAM CORP	10	7	7.25	-0.1	-1.7
N	DECISION INDS CORP	13	7	12.50	+0.9	+7.5
N	EASTMAN KODAK CO	92	52	88.75	-1.0	-1.1
Q	E M C CORP MASS	34	11	31.50	+2.8	+9.6
Q	EMULEX CORP	10	5	7.63	-0.6	7.6
Q	EVANS & SUTHERLAND	40	50	30.50	-2.0	-6.2
N	IDOT CORP	13	9	9.38	-0.1	-1.9
Q	INTERLEAF INC	50	6	16.88	+0.5	+3.1
Q	IOMEGA CORP	12	2	3.13	+0.0	+0.0
Q	LEE DATA CORP	10	5	5.00	-0.1	2.4
Q	MASSTOR SYS CORP	9	2	5.75	+1.2	+26.0
Q	MAXTOR CORP	34	12	15.88	-2.1	-11.8
Q	MICROPOLIS CORP	44	14	50.63	-3.4	-8.7
Q	MINISCRIBE CORP	19	5	13.13	-1.4	-9.9
N	MINNESOTA MNG & MFG CO	73	50	88.75	-1.1	-1.8
A	MSI DATA CORP	19	10	17.13	+0.3	+1.5
Q	PRIAM CORP	9	2	3.63	-0.5	-12.1
Q	PRINTRONIX INC	14	10	12.50	+0.1	+1.0
N	QMS INC	20	11	19.00	+0.3	+4.1
Q	QUANTUM CORP	35	15	16.00	-1.8	-9.9
Q	RAMTEX CORP	9	4	5.00	-0.3	-4.8
N	RECOGNITION EQUIP INC	27	10	16.88	-1.1	-5.9
Q	REXON INC	14	5	9.00	-0.9	-8.9
Q	SCAN TRON CORP	17	11	12.50	+0.3	+2.0
Q	SEAGATE TECHNOLOGY	48	11	26.63	-3.1	-9.8
N	STORAGE TECH CORP	5	2	3.63	+0.1	+3.6
Q	TANDON CORP	7	2	5.25	+0.0	+0.0
A	TEC INC	7	3	5.13	-0.1	-2.4
N	TEKTRONIX INC	43	28	37.88	-0.3	-0.7
Q	TELEVIDEO SYS INC	3	2	2.50	+0.0	+0.0
N	TELEX CORP	102	53	97.25	-2.5	3.6
Q	WYSE TECH	38	13	50.25	+2.3	+8.0
N	XEROX CORP	91	61	72.50	-3.0	-4.0
Q	XIDEX CORP	20	11	12.88	+0.4	+3.0

Leasing Companies

N	COMDISCO INC	33	15	28.00	-1.0	-3.3
N	CONTINENTAL INFO SYS	14	7	11.25	-0.4	-2.2
Q	PHOENIX AMERN INC	9	3	4.63	-0.1	2.8
Q	SELECTERM INC	7	5	6.00	+0.8	+14.3
N	U S LEASING INTL	63	38	50.50	-1.1	-2.2

EXCH: N—NEW YORK; A—AMERICAN; Q—NATIONAL; O—OVER-THE-COUNTER; S—SPLIT

O-T-C PRICES ARE BID PRICES AS OF 3 P.M. OR LAST BID
(1) TO NEAREST DOLLAR

Fickle market

DG issues rise in face of layoffs; DEC drops despite earnings

The vicissitudes of stock market reaction to corporate news were put in sharp focus last week by the movements of Digital Equipment Corp. and Data General Corp.

After DEC announced another record-breaking quarter on Wednesday, its stock plunged 6½ points to 158½. But DG, after announcing a $65.1 million loss and a 950-employee layoff, rose ¾ of a point in Thursday's trading to 30⅝.

Market watchers attributed DEC's drop to some of its profit growth coming from a lower tax rate, while others speculated that DEC's industry-leading growth may be nearing the end of its cycle.

But DEC said its business shows no sign of slowing down.

The stock bounced back Thursday, rising 2⅜ points to 160⅞ in heavy trading. Mark Steinkrauss, DEC's director of investor relations, said the stock experienced strong buying early in the trading session by European and Japanese money managers.

DG's rise stemmed from analysts' mostly positive reactions to DG's layoffs and closings, which the company said will improve profitability in fiscal 1988.

CLINTON WILDER

Mixed quarter for software

BY CLINTON WILDER
and ADAM STONE
CW STAFF

The second-quarter financial reports of three major software vendors last week showed mixed results. While Microsoft Corp. and Computer Associates International, Inc. continued to post growth rates that are the envy of the industry, Management Science America, Inc. (MSA) reported a $1 million loss because of the continued red ink at its recently acquired Ireland subsidiary, Real-Time Systems (RTS).

Atlanta-based MSA said RTS, acquired last summer, will have higher than anticipated losses for the year, which will reduce MSA's earnings potential. However, MSA President William Graves said in an interview that the rest of the company's business is "pretty much on target" for the year. MSA traditionally earns most of its profit in the fourth quarter.

MSA reported a loss of $1 million, or 6 cents per share, on revenue that grew 26% from year-earlier levels to $60.1 million. MSA earned $5.9 million, or 33 cents per share, a year ago.

European market

RTS, which sells IBM System/36 and 38 software to the European manufacturing market, lost an estimated $7 million in the first two quarters, according to Paine Webber, Inc. analyst Robert Therrien. "If it weren't for RTS, they would have made money," Therrien said. "I think they didn't know exactly what they were getting when they bought it."

Graves said MSA has seen the end of the pause in sales activity that it experienced while integrating its Comserv, Inc. acquisition and reorganizing the MSA sales force along industry lines.

Computer Associates reported record results for its first fiscal quarter, with sales of $89.1 million, up 78% from the same period last year.

Net income for the quarter was $4.1 million, nearly double the $2.3 million figure reported in last year's first quarter.

The results do not reflect the results of the company's announced merger with Uccel Corp., scheduled for shareholder approval in mid-August.

Sales were helped by the company's announcement in April that it would switch from site licensing to licensing by CPU, according to analyst Terence Quinn of E. F. Hutton & Co. In anticipation of the switch, companies planning large purchases sped up their schedules in order to buy at the by-site cost, Quinn said.

Microsoft reported a strong quarter and year, with annual revenue up 75% from 1986.

The company reported revenue for the fourth quarter ended June 30 of $99.8 million, up 61% from $62 million in the like quarter of 1986.

Checked momentum

Microsoft could have performed even better, analysts said, but its momentum was checked by an industrywide slowdown in microcomputer sales.

Profit was $17.3 million, or 62 cents per share, up 67% from last year's fourth quarter.

Revenue for the fiscal year was $345.9 million, up 75% from $197.5 million last year. As reported, net income was $71.9 million, or $2.60 a share.

3Com, Bridge plan merger

BY CLINTON WILDER
CW STAFF

SANTA CLARA, Calif. — 3Com Corp. announced late Friday that it will attempt another acquisition, this time a merger with fellow local-area network (LAN) maker Bridge Communications, Inc. in Mountain View, Calif.

Under terms of the agreement, Bridge would become a wholly owned subsidiary of 3Com. The combined company will retain the 3Com name.

Bridge President William Carrico will become president and chief operating officer of 3Com and jointly form an office of the chief executive with 3Com Chief Executive Officer L. William Krause.

3Com founder Robert Metcalfe will continue in his current position as senior vice-president of technology.

The merger involves a stock swap in which each outstanding share of Bridge will be exchanged for 1.4 shares of 3Com stock, resulting in Bridge shareholders owning 42% of the merged company. Based on Friday's closing stock price, the market value of Bridge was approximately $195 million.

3Com has seen three major acquisition attempts fall through in recent years.

Tailspin

FROM PAGE 1

the credibility issue to customers, and that hurts the marketing," said Stephen Dube of Shearson Lehman Brothers, Inc. "The lack of any revenue progress is clearly a disappointment compared to the industry."

In an interview, DG President Edson deCastro admitted DG's efforts to penetrate the Fortune 1,000 market have hurt the company. "In the early 1980s, we got distracted by large end-user sales and let a number of our OEMs and value-added resellers [VAR] down," he said. "Lately, we have found that very large companies are more comfortable doing business with very large companies. We will reduce our efforts to sell to the largest and concentrate on companies closer to our size — $500 million to $2.5 billion."

Patricia Seybold, a Boston-based office automation consultant to many large corporate users, said DG's CEO office system is rarely considered in corporate buying decisions. "No one asks me about DG systems anymore," she said. "How many large suppliers are you going to accommodate in your buying decisions? There are IBM and DEC and probably Wang for office systems because of their large word processing base. Most large companies don't have a large commitment to DG."

CEO stalled

Seybold noted that CEO seemed to be gaining momentum two years ago when DG made major sales to E. F. Hutton & Co. and to the U.S. government, but the product lost the momentum and never recovered.

DG has also been plagued by several key management defections in the past two years, including those of Robert C. Miller, senior vice-president of information systems; David Chapman, senior vice-president of manufacturing; Kenneth Jaeggi, vice-president and chief financial officer; Clifford Bream, vice-president of distribution; James Pitts, vice-president and controller; Howard Haythornthwaite, vice-president of Asia/Pacific manufacturing; Charles Boesenberg, vice-president of European operations; and Frank Pinto, division director of marketing support.

"DG is becoming as tightly centralized as Wang used to be, and that's a dangerous sign," Seybold said. "I've been told it's impossible for product managers to get commitments that stick, and even a $1,000 seminar fee has to be approved at the top. That really undermines morale and creates a highly politicized situation."

"They have to refocus their position in a certain series of vertical markets," added John McCarthy, research manager for Forrester Research, Inc. in Cambridge, Mass. "They might be able to hang on, but not as a full-range supplier. If I were a user, I would certainly be rethinking my commitment to that company."

DG, founded by deCastro, a former DEC engineer, is among the youngest of the full-service systems vendors. Although the company pulled ahead of DEC in the early 1980s on the advanced supermini technology chronicled in the Pulitzer Prize-winning book *The Soul of a New Machine*, DG never developed the installed base among corporate MIS departments that its predecessors had.

"The curse is that they were a newer company and therefore a smaller company," said John Rutledge of Dillon Read & Co. "The industry is now maturing, and there is not enough room for as many vendors. They're getting squeezed out."

DG said it will lay off employees primarily in manufacturing, administrative and field engineering positions, but a spokesman said the firm will try to increase its sales force by 15% in the coming year.

'Too many levels'

DeCastro said the current round of cost-cutting is more specifically focused on centralizing operations than the cuts of the past two years. "We just plain ended up with too many levels of management and bureaucracy," he said. All but a handful of the job cuts will take place in the U.S. at DG locations in Massachusetts, New Hampshire and Colorado. The company will close administrative facilities in Hooksett, N.H., and Denver and a field engineering office in Milford, Mass.

In sharp contrast to DG, Maynard, Mass.-based DEC continued to fly high. Fourth-quarter earnings grew 58% to $377.2 million, or $2.85 per share, while sales jumped 23% to $2.67 billion. For the year, DEC's revenue soared over the $9 billion mark to $9.39 billion, up 24% from fiscal 1986. Profits grew 84% to $1.14 billion, or $8.53 per share.

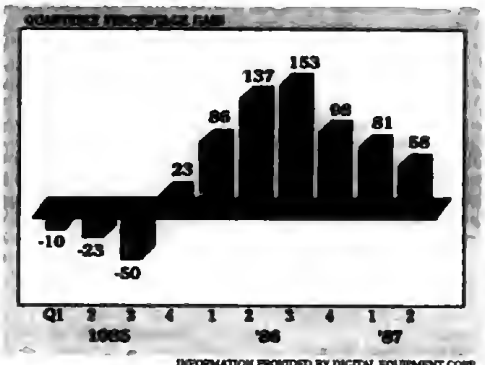
Although DEC benefited considerably in the quarter from a more favorable tax rate, analysts said they feel the company remains well positioned for continued growth.

"The much-heralded IBM mid-range threat won't be in place for another 12 months or so," said Dube of Shearson Lehman. "There is little that will happen to derail DEC's locomotive speed."

Senior writer David Bright and intern Adam Stone contributed to this report.

Sustained energy

DEC continues its almost two-year string of improved quarterly profits in year-earlier comparisons



INFORMATION PROVIDED BY DIGITAL EQUIPMENT CORP.
CW CHART

CDC, Cray financial results slip

MINNEAPOLIS — Despite the general computer industry trend toward improved financial performance, both Control Data Corp. and Cray Research, Inc. reported disappointing second-quarter results last week.

CDC, after its brief return to profitability in the first quarter, reported a loss of $5.5 million, or 14 cents per share, on revenue that fell 5% from year-earlier levels to $785.9 million.

The company cited several factors for the deficit and reiterated its prediction of last month that full-year results would fall short of original expectations.

In the year-earlier quarter, CDC reported a loss of $7.8 million, or 20 cents per share.

Cray Research, proving the volatility of its supercomputer business, reported its slowest quarter in more than two years.

The company's earnings fell 56% from a year earlier to $19.6 million, or 64 cents per share, while sales declined 31% to $124.9 million.

Court clears CIS's buy-out of CMI

Sale by holding companies would create second largest third-party lessor

BY CLINTON WILDER
CW STAFF

BIRMINGHAM, Ala. — A state court last week upheld the proposed buy-out of computer leasing firm CMI Corp. by Continental Information Systems Corp. (CIS), paving the way for a giant lessor that will dwarf all but one of its third-party leasing competitors.

Almost two months after CMI executives filed suit to block the takeover [CW, June 1], 10th Judicial Circuit Judge Jack Carl ruled that CMI's two holding companies could sell 100% of CMI's stock to Syracuse, N.Y.-based CIS. The total purchase price should be approximately $50 million, and CIS Chairman Harry Goetzmann Jr. said the acquisition will be completed within 30 days.

The merger will create a firm with annual revenue of approximately $650 million, second only to Comdisco, Inc. in the independent computer leasing industry.

'Ready to move'

"We're ready to move in," Goetzmann said. He declined comment on any of his company's plans for CMI until the stock purchase is completed.

Goetzmann had said earlier that the combined company would retain the CIS name and have about 900 employees.

The CMI management group that has opposed the deal, led by Chairman Edward Cherney, filed an appeal to last week's decision in the Alabama Supreme Court.

"CMI is very disappointed in the decision," a spokesman said.

No delay

Goetzmann said the appeal was expected and that its filing will not delay the acquisition process.

Cherney's group had filed suit against Bloomfield Hills, Mich.-based CMI's two parent companies — Torchmark Corp. in Birmingham and Stephens, Inc., which is based in Little Rock, Ark.

Torchmark and Stephens, both financial services firms, controlled 70% of CMI's equity, whereas CMI management controlled a total of 30%.

Some observers said they have wondered about possible consequences of the CIS takeover for computer lessees who chose CMI over CIS in competitive bid situations.

But most corporate users who lease mainframe computers and peripherals believe competitive bidding has thrived despite the ongoing consolidation that is occurring in the leasing industry, according to a recent series of *Computerworld* interviews [CW, July 6].

Lee Data, Olivetti form joint 3270 venture

BY ADAM STONE
CW STAFF

MINNEAPOLIS — Lee Data Corp. announced last week that it has signed an agreement with Ing. C. Olivetti & Co. to form joint-venture companies to market a combination of Lee Data and Olivetti products for the IBM 3270 market in countries outside the U.S and Italy.

Analysts speculated that this move indicates Olivetti's growing interest in the 3270 market. "Clearly, they want to be more involved," said Clinton Morrison, an analyst at Dain Bosworth, Inc. "Now they have an equity interest in these products — it's not just another product line."

For Lee Data, access to Olivetti's technology "fills in voids in their product line that they could not fill on their own," according to Gary Smaby, an analyst at Piper, Jaffray & Hopwood, Inc. "Lee Data is a small enough company that they just don't have the resources to stand on the leading edge" of personal computer, workstation, local-area network and printer technology, Smaby said. "Olivetti can do a lot for them."

> "MAYBE they're testing the waters for something more serious."
>
> CLINTON MORRISON
> DAIN BOSWORTH, INC.

Olivetti continues to market Lee Data products in Italy under the Olivetti name, in continuation of an OEM agreement the firms began in 1982. This most recent agreement may augur an even closer relationship, analysts said.

"Maybe they're testing the waters for something a little more serious down the line," Morrison said. "This relationship is definitely heating up, and clearly, there's a good fit between the two companies."

The companies are also said to be planning a joint venture to market the same product line in West Germany, and plans are in the works for similar projects in France, Spain, Canada and Australia.

According to the agreement, Olivetti will buy 51% of Lee Data International Ltd., a wholly owned subsidiary of Lee Data based in England. Revenue from the joint venture will be consolidated into Olivetti's financial statements; net income will be divided between the two companies by ownership percentage.

The joint venture is expected to begin within the next several months.

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INSIDE LINES

Which of these things doesn't belong? In an announcement slated for Aug. 3 in New York, Tandy is expected to enhance its product line with several pieces of hardware. Usually knowledgeable sources claim the firm will add an Intel 80386 microcomputer, configurable as a server; an Intel 80286 machine that may be positioned to run Microsoft's Xenix as a small-scale, multiuser system; a laser printer; a Microsoft MS-DOS-based laptop; and a low-end machine. But a Tandy executive says one of the elements predicted by the sources is not set for release at announcement time.

This is export control. Lapine Technology, a Milpitas, Calif., maker of low-capacity 3½-in. hard disk drives, has laid off all but a handful of staff members, shrinking from a one-time high of about 92 employees to less than 10. Lapine's problems stem from disagreements with Kyocera International of Japan, Lapine's sole manufacturing source for its hard-disk products. Because of the rise of the yen, Kyocera's Japanese manufacturing plant has reportedly been unable to make Lapine's disk drives at a reasonable cost and has cut down the supply.

How quickly they forget. Former highflier Iomega recently cut prices by 25% on its 8-in. Bernoulli box storage subsystems and laid off all workers involved with that product. Meanwhile, the company says it is developing a 3½-in. storage system for microcomputers for release in late 1988. In addition, a rewritable optical disk drive system is being researched at the firm's Boulder, Colo., facility.

Not on my account. While reserves for foreign loan losses stole the spotlight, the $1.14 billion net loss reported by beleaguered Bank America last week also included a $25 million charge for problems with a computer system for tracking customers' pension and benefit plans. The system, named Masternet, went on-line in March and cost $20 million. The charge, which is in addition to that cost, arises chiefly from troubles producing and delivering statements to customers, according to bank spokesman Jack Houseman. No customer data was lost, he said.

Reach out and touch someone. In a move to reach out to telecommunications managers and stress the interdependence of computer hardware with communications, Guide International is considering holding a joint meeting with the Rolm Users Group in July 1988 in Chicago, according to Guide President John Nack, who was in Boston last week for the 68th Guide meeting.

Catch-22. Reports that DEC will introduce a CMOS Microvax system running at 2.5 MIPS or faster by September are countered by one analyst who says DEC fears cannibalizing the lower end of its VAX 8000 series. "DEC wants the Microvax II to run out of gas pretty soon, so users will move up to an 8250," maintains Dataquest analyst Kimball Brown. A key reason is that DEC makes a much better profit on the VAX 8000 line. But DEC has a tricky solution to the problem of overlapping performance ranges, says International Data Corp.'s Bob Randolph. DEC will bring out a 3.5- to 4-MIPS Microvax chip but will "crank it down to about 1.5 MIPS" for the Microvax III's September debut, Randolph says. That way, DEC would lessen the overlap problem but still be able to boost performance later if necessary.

Dbeat of Dfall? A knowledgeable source laid out Ashton-Tate's product plans for the next nine months, which include a new version of Dbase, Dbase IV, planned for a Comdex/Fall '87 announcement. Dbase IV, which runs under the existing MS-DOS environment, includes an enhanced version of the Dbase language, better performance and a rudimentary version of SQL, which is on the "periphery of the product and not yet fully integrated," the source said. Dbase IV will also feature a developers' tool kit, which contains code for commonly used routines. Ashton-Tate will also boost Framework, the firm's integrated package. Because Framework serves many users as a low-level data base engine, the firm said it will embed a subset of SQL. Framework III will ship early next year. Ashton-Tate is also at work on a graphics product to compete directly with Lotus's Freelance Plus.

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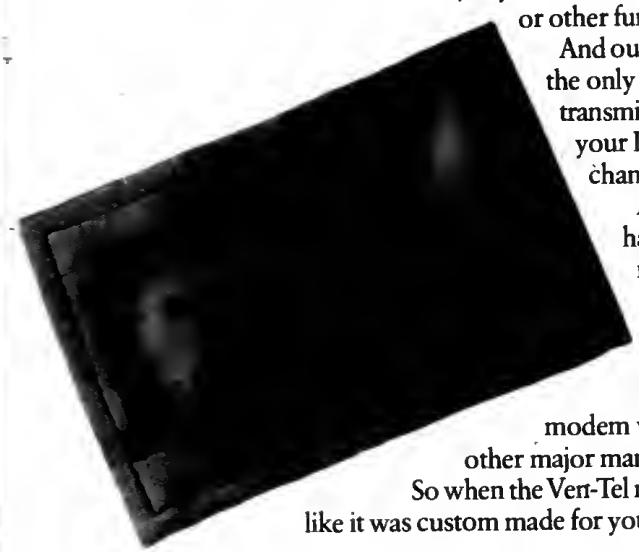

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